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Issues in Intelligence Production

Summary of interviews with Canadian managers of intelligence analysts

Natalia Derbentseva
Lianne McLellan
David R. Mandel

Defence R&D Canada
Technical Report
DRDC Toronto TR 2010-144
December 2010

Canada

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Principal Author

Original signed by Natalia Derbentseva

Natalia Derbentseva

Defence Scientist

Approved by

Original signed by Keith Stewart

Keith Stewart

Section Head, Adversarial Intent

Approved for release by

Original signed by Kim Wulterkens

Kim Wulterkens

For Chair, Knowledge and Information Management Committee

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In conducting the research described in this report, the investigators adhered to the policies and procedures set out in the Tri-Council Policy Statement: Ethical conduct for research involving humans, National Council on Ethics in Human Research, Ottawa, 1998 as issued jointly by the Canadian Institutes of Health Research, the Natural Sciences and Engineering Research Council of Canada and the Social Sciences and Humanities Research Council of Canada.

Abstract

Intelligence analysis provides important informational support to civilian and military decision makers. Recent intelligence failures of Canada's allies have been attributed mostly to cognitive, social, and organizational deficits and biases of individual analysts and intelligence agencies. Such attributions call for a comprehensive examination of intelligence production from the socio-psychological perspective. The present report discusses findings from interviews conducted with Canadian managers of intelligence analysts. The interviewed managers identified a number of pertinent issues in the intelligence production process that may be explicated through the application of the behavioural sciences' accumulated knowledge and methodology. The identified issues are discussed in light of the intelligence studies and behavioural sciences literature, and a roadmap for the behavioural sciences research program in support of the intelligence function is outlined.

Résumé

L'analyse du renseignement offre un important soutien informationnel aux décideurs civils et militaires. Les récents échecs d'alliés du Canada dans le domaine du renseignement ont été principalement attribués à des lacunes cognitives, sociales et organisationnelles, ainsi qu'aux préjugés des analystes et des organismes du renseignement. Un tel constat exige la tenue d'un examen en profondeur de la production du renseignement d'un point de vue socio-psychologique. Le présent rapport porte sur les conclusions tirées des entrevues menées auprès de gestionnaires canadiens d'analystes du renseignement. Les gestionnaires interviewés ont dégagé un certain nombre de problèmes pertinents dans le processus de production du renseignement que l'on pourrait expliquer par la mise en application des connaissances et des méthodes acquises dans le domaine des sciences du comportement. Les problèmes relevés sont abordés sur la base d'études sur le renseignement et de publications sur les sciences du comportement. Le rapport contient également l'aperçu de la feuille de route d'un programme de recherche en sciences du comportement qui appuierait la fonction du renseignement.

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Executive summary

Issues in Intelligence Production: Summary of interviews with Canadian managers of intelligence analysts

Derbentseva, N.; McLellan, L.; Mandel, D.R.; DRDC Toronto TR 2010-144; Defence R&D Canada – Toronto; December 2010.

Introduction or background: Intelligence analysis is an important state function that informs and supports policy and command-and-control decision making. Intelligence analysts seek to reduce uncertainty and improve decision quality for intelligence consumers by employing their analytic skills to derive judgments from available information, much of which is uncertain and which may also conceal deception. Because intelligence analysis predominantly relies on human reasoning and judgment, there is considerable opportunity for the behavioural sciences to be applied to the task of better understanding and ultimately improving intelligence analysis. However, the open-source, unclassified literature on the application of behavioural science to intelligence analysis is scarce, reflecting the fact that there is a paucity of applied behavioural science in support of intelligence. In the present technical report, an investigative interview study is described. The study aimed to identify pertinent issues in intelligence analysis and to develop a roadmap for future behavioural science research that could support the intelligence analysis function.

Method: The present study was conducted by members of the Thinking, Risk, and Intelligence Group (TRIG) in the Adversarial Intent Section at Defence R&D Canada – Toronto, as part of the preliminary research for an Applied Research Program project on understanding and augmenting human analytic capabilities for intelligence, under the sponsorship of the Chief of Defence Intelligence (CDI). TRIG researchers conducted semi-structured interviews with seven intelligence managers from two Canadian intelligence organizations – CDI and International Assessment Staff of the Privy Council Office. Interview discussions covered a variety of topics: Analysts' tasks and analytic process, challenges in intelligence analysis, essential skills required for intelligence analysis, the selection process of analysts, training, analytic tools, managers' roles and challenges, and characteristics of the Canadian intelligence community at large.

Results: Managers' responses identified several areas for further research, including the following:

Study of cognitive processes involved in information search, evaluation, and analysis: Behavioural science research could be instrumental in revealing how different formulations of an intelligence question may affect judgment; understanding processes that underlie the tendency among analysts and consumers to overly rely on classified information based solely on the fact that it is classified; investigating the role and the impact of a number of cognitive biases (such as confirmation bias, mirror imaging, and status quo), which may impair analysts' judgment; understanding the mechanisms for coping with information overload and tradeoffs between the continuing search for new information and the analysis of the available evidence; and identifying roots and devising means for dealing with such analysts' behaviours as decision avoidance, defensiveness and unwillingness to accept other perspectives on the issue they analyzed.

Identifying essential skills required for intelligence analysis and developing skill assessment tools: Research on individual differences accumulated in the behavioural sciences could be instrumental in identifying the set of essential, inherent and acquired abilities that are required for intelligence analysis. Identifying these skills and abilities and developing reliable measures of these attributes may improve the analyst selection and performance evaluation processes, and support the development of intelligence analysis training programs.

Systematic evaluation of analytic tools and techniques: Systematic scientific evaluation of the available tools and techniques can provide a better understanding of their drawbacks and benefits to support analysis and the conditions required for their application.

Developing methods for evaluating training effectiveness: Objective evaluation of intelligence analyst training can support the development of training programs and facilitate transfer of training to the workplace.

Surveying current knowledge management practices and needs: Further survey research along such lines could be informative to the community in dealing with knowledge preservation and transfer issues arising from such organizational challenges as turnover and inadequate staffing.

Investigating new methods for product and performance evaluation: Due to the lack of unambiguous evaluation criteria and variability of analytic standards and requirements, intelligence product evaluation mostly relies on managers' subjective judgment. The community can benefit from the development of more objective means for evaluating analysts' performance, such as accuracy of their aggregate judgments.

Organizational analysis: Organizational analysis can be instrumental in identifying the sources of issues such as inadequate staffing, time pressure, turnover (mainly of military analytic personnel), lack of feedback on final intelligence products, and barriers in inter-agency and inter-departmental information sharing. All of these issues can impact analysts' productivity and contribute to the disruption of organizational processes, loss of expertise, and organizational memory.

Significance: The present report summarises results of a unique interview study with Canadian managers of intelligence analysts. Various issues identified by the managers are discussed in light of both intelligence studies and the behavioural sciences literature. Based on input from these intelligence managers, the report outlines a roadmap for behavioural sciences research in support of the intelligence analysis function. Scientific research in the identified areas would improve our understanding of the outlined issues and could provide valuable insights into, and means of, augmenting human performance in intelligence production.

Future plans: The identified areas for research and development encompass many issues and span several disciplines. Research efforts in several of the identified areas are already underway in TRIG, such as calibration of analysts' judgment accuracy, communication of verbal probability estimations, the role of reliability and diagnosticity of information in decision making, belief revision based on new evidence, evaluating the effectiveness of cultural sensitivity training, the relationship between individual differences and accuracy and coherence in decision making, the impact of question framing on probability estimation, and means for visualizing knowledge and information. However, it would be impossible to address all of the questions discussed in the report within a scope of a single project. The research team will identify priorities for future work

through continuous and close interaction with members of the Canadian intelligence community to ensure that the research efforts address the needs of that community, and especially the needs of our sponsors and partners.

Sommaire

Issues in Intelligence Production: Summary of interviews with Canadian managers of intelligence analysts

Derbentseva, N.; McLellan, L.; Mandel, D.R.; DRDC Toronto TR 2010-144; R & D pour la défense Canada – Toronto; Décembre 2010.

Introduction ou contexte: L'analyse du renseignement est une importante fonction d'état qui sert de base et qui contribue à la prise de décisions en matière de politique et de commandement et contrôle. Les analystes du renseignement visent à réduire les incertitudes et à améliorer la qualité des décisions prises par les utilisateurs du renseignement en mettant à profit leurs capacités d'analyse pour formuler des jugements à partir des informations disponibles, qui sont pour la plupart incertaines et susceptibles d'être fausses. Comme l'analyse du renseignement repose principalement sur le raisonnement et le jugement humains, il s'agit d'une excellente occasion d'appliquer les principes des sciences du comportement dans le but de mieux comprendre l'analyse du renseignement et, en fin de compte, de l'améliorer. Cependant, la documentation non classifiée et en libre accès sur l'application des sciences du comportement à l'analyse du renseignement est peu abondante, ce qui témoigne du manque de recherche en sciences appliquées du comportement à l'appui du renseignement. Le présent rapport technique contient la description d'une étude approfondie réalisée par le biais d'entrevues. Le but de l'étude était de dégager des problèmes pertinents dans le domaine de l'analyse du renseignement et d'élaborer la feuille de route d'un futur programme de recherche en sciences du comportement qui appuierait la fonction du renseignement.

Méthode : La présente étude a été menée par des membres du Groupe réflexion, risque et renseignement (TRIG) de la Section des intentions antagonistes de R & D pour la défense Canada – Toronto, dans le cadre de la recherche préliminaire sur le projet Programme de recherches appliquées, qui porte sur la compréhension et l'augmentation des capacités humaines d'analyse du renseignement et qui est parrainé par le Chef du renseignement de la défense. Les chercheurs du TRIG ont mené des entrevues semi-structurées auprès de sept gestionnaires d'analystes du renseignement provenant de deux organismes du renseignement canadiens – le Chef du renseignement de la défense et le Bureau de l'évaluation internationale du Bureau du Conseil privé. Les entrevues ont porté sur divers sujets : les tâches et le processus analytique des analystes, les difficultés de l'analyse du renseignement, les compétences essentielles requises pour réaliser des analyses du renseignement, le processus de sélection des analystes, la formation, les outils d'analyse, le rôle et les défis des gestionnaires et les caractéristiques de la communauté canadienne du renseignement dans son ensemble.

Résultats: Les réponses des gestionnaires ont permis de cerner plusieurs aspects nécessitant une recherche plus approfondie, à savoir les suivants :

Étude des processus cognitifs intervenant dans la recherche, l'évaluation et l'analyse d'informations : La recherche en sciences du comportement pourrait contribuer à révéler comment différentes formulations d'une question sur le renseignement peuvent avoir une incidence sur le jugement; à comprendre le processus qui est à l'origine de la tendance, chez les analystes et les utilisateurs du renseignement, à trop se fier à l'information classifiée du seul fait

qu'elle soit classifiée; à étudier le rôle et les répercussions de différents préjugés cognitifs (p. ex., préjugé fondé sur la confirmation, image-miroir et statu quo) pouvant altérer le jugement des analystes; à comprendre les mécanismes permettant de faire face à la surdose d'information et aux compromis à faire entre la recherche de nouvelles informations et l'analyse des données disponibles; et à déterminer les origines de certains comportements observés chez les analystes, comme le fait d'éviter de prendre une décision, l'attitude défensive et la réticence à accepter d'autres points de vue sur ce qu'ils sont en train d'analyser, ainsi qu'à élaborer des méthodes pour faire face à ces comportements.

Identification des compétences essentielles requises pour réaliser des analyses du renseignement et élaboration d'outils pour l'évaluation des compétences : Les recherches sur les différences individuelles accumulées en sciences du comportement pourraient jouer un rôle important dans l'établissement de l'ensemble des compétences essentielles inhérentes et acquises nécessaires pour réaliser des analyses du renseignement. L'identification de ces compétences et habiletés et la définition de mesures fiables de ces attributs pourraient permettre d'améliorer les processus de sélection et d'évaluation du rendement des analystes, ainsi que d'appuyer la mise sur pied de programmes de formation en analyse du renseignement.

Évaluation systématique des outils et des techniques d'analyse : L'évaluation scientifique systématique des divers outils et techniques d'analyse disponibles peut permettre de mieux en comprendre les avantages et les inconvénients et de connaître les conditions dans lesquelles ils doivent être utilisés.

Élaboration de méthodes pour évaluer l'efficacité de la formation : Une évaluation objective de la formation des analystes du renseignement peut contribuer à l'élaboration de programmes de formation et faciliter le transfert de la formation dans le milieu de travail.

Étude portant les pratiques et les besoins courant en matière de gestion des connaissances : Des recherches plus approfondies sur ces sujets pourraient aider la communauté à régler les questions liées à la conservation et au transfert des connaissances découlant d'enjeux organisationnels comme le roulement et le manque de personnel.

Recherche de nouvelles méthodes d'évaluation des produits et du rendement : En raison du manque de critères d'évaluation non ambigus et de la variabilité des normes et des exigences en matière d'analyse, l'évaluation des produits du renseignement repose principalement sur le jugement subjectif des gestionnaires. La communauté tirerait avantage de la définition de méthodes d'évaluation du rendement des analystes plus objectives, par exemple pour mesurer l'exactitude de l'ensemble de leurs décisions.

Analyse organisationnelle : Une analyse organisationnelle pourrait contribuer à l'identification des sources de problèmes, comme le manque de personnel, les contraintes de temps, le roulement du personnel (surtout les analystes militaires), le manque de rétroaction sur les produits finaux du renseignement et les obstacles dans le partage de l'information entre les différents organismes du renseignement et ministères. Tous ces facteurs peuvent avoir une incidence sur la productivité des analystes et contribuer à la perturbation des processus opérationnels, ainsi qu'à la perte d'expertise et de mémoire organisationnelle.

Signification: Le présent rapport contient la synthèse des résultats d'une étude unique basée sur des entrevues menée auprès de gestionnaires canadiens d'analystes du renseignement. Les divers

problèmes soulevés par les gestionnaires sont abordés sur la base d'études sur le renseignement et de publications sur les sciences du comportement. Le rapport contient l'aperçu de la feuille de route d'un programme de recherche en sciences du comportement à l'appui de la fonction du renseignement, établie en fonction des commentaires formulés par les gestionnaires du renseignement. La recherche scientifique dans les domaines identifiés permettrait d'améliorer notre compréhension des problèmes soulevés et pourrait fournir des renseignements utiles sur les façons d'améliorer le rendement humain en matière de production du renseignement.

Perspectives: Les domaines identifiés pour la recherche et le développement englobent un grand nombre de problèmes et couvrent plusieurs disciplines. Les efforts de recherche dans plusieurs de ces domaines sont déjà en cours au TRIG, comme la calibration de l'exactitude du jugement des analystes, la communication des estimations relatives à la probabilité linguistique, le rôle de la fiabilité et de la diagnosticité de l'information dans la prise de décisions, la conservation de la cohérence en fonction de nouvelles données probantes, l'évaluation de l'efficacité de la formation sur les différences culturelles, la relation entre les différences individuelles et l'exactitude et la cohérence dans la prise de décisions, les répercussions de la formulation des questions sur l'estimation des probabilités, et les moyens pour visualiser les connaissances et l'information. Toutefois, il serait impossible de régler toutes les questions exposées dans ce rapport dans le cadre d'un seul projet. L'équipe de recherche établira les priorités des futurs travaux par le biais d'une collaboration continue et étroite avec des membres de la communauté canadienne du renseignement pour veiller à ces que les efforts de recherche répondent aux besoins de cette communauté, en particulier ceux de nos parrains et de nos partenaires.

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1 Introduction

Intelligence analysis is an important state activity aimed to inform and support policy and command decision making (Davis 2006, Jervis 1991). The ultimate goal of the intelligence function is to provide timely and relevant information to decision makers to aid their understanding of the issues at hand and to allow them to make more informed decisions.

Production of intelligence involves a variety of activities such as assessment of intelligence requirements, search, collection, evaluation and analysis of information, and communication of the outcomes of the assessments. A number of individuals and organizations carry out these activities. Intelligence analysis is one of the functions in the myriad of steps involved in producing usable intelligence. Intelligence analysts search through, evaluate, select, and interpret available information to produce intelligence products. Intelligence analysis, often characterized as putting together a puzzle with many missing pieces (Johnson 2007), is an inherently challenging process, characterized by a great deal of uncertainty (Davis 1992, Heuer 1999, Lefebvre 2004) and constantly increasing data overload due to advancements in information and communication technologies (Johnson 2007, Treverton 2001, Woods et al. 2002).

More recent intelligence failures such as those that led to the tragic events of September 11, 2001, and inaccurate assessments of Iraqi weapons of mass destruction (WMD) capability were attributed to failures in analysis (Bruce and George 2008). These events drew a lot of public attention to the intelligence community (IC). As a result, the intelligence communities and practices of Canada's allies have been subjected to commissions of inquiry and reviews of analytic capability (Butler et al. 2004, 9/11 Commission 2004). Scrutiny of the IC and its practices has uncovered a number of potential causes of intelligence failures including ineffective leadership, lack of inter-organizational coordination and information sharing (Hulnick 2008), poor quality of available information (Pritchard and Goodman 2009), "lack of analytical imagination," that is, an inability to generate (unlikely) hypotheses which, in turn, leads to a failure to generate (proper) collection requirements (Bruce 2008), failures to properly interpret available information due to cognitive biases and mindsets (Butterfield 1993, Heuer 1999), and failures of decision makers in heeding accurate intelligence assessments. In addition, intelligence misjudgements are inevitable because the possibility of a mistake is inherent in the nature of intelligence activity (Brady 1993, Heuer 1999).

A key mandate of the Thinking, Risk, and Intelligence Group (TRIG) in the Adversarial Intent Section (AIS) at Defence R&D Canada – Toronto (DRDC Toronto) is to conduct scientific activities in support of the Canadian intelligence analysis function. Under the direction of the senior author, Dr. David Mandel, and under the sponsorship of Capt(N) M.J. Barber, Director of Intelligence Capability, Chief of Defence Intelligence (CDI), a 5-year Applied Research Program (ARP) project (15dm), entitled "Understanding and Augmenting Human Capabilities for Intelligence Production" is currently underway. In the scoping year for this project, a research team from TRIG conducted interviews with managers from two Canadian intelligence organizations. The purpose of the interviews was twofold: to educate the research team about the organization and challenges of intelligence production in the Canadian IC, and to identify areas where scientific research might prove beneficial for augmenting the intelligence process. The topics discussed with the managers include the tasks and challenges that intelligence analysts face, the skills and capabilities that are essential to producing high quality intelligence

assessments, the selection process for analysts, performance evaluation, and current practices and developments in the IC writ large.

The main purpose of this report is to summarize the findings from the interviews conducted with managers. The report is structured in the following manner: Section **2** describes the study method, Section **3** provides a summary and discussion of the interviews, and Section **4** outlines areas for further investigation that might help to augment the intelligence analysis function.

This research was approved by the DRDC Human Research Ethics Committee (HREC) under protocol L-638.

2 Method

2.1 Participants

Seven managers from two Canadian intelligence organizations – three from the International Assessment Staff (IAS) and four from CDI – participated in the interviews. Interviews were conducted during the summer and fall of 2008. Participants' experience in the intelligence domain ranged between 6 and 21 years (median: 11 years), and their experience in the management role within the intelligence domain ranged between 2 and 20 years (median: 8 years).

Only half of the managers had intelligence analysts directly reporting to them. However, the number of analysts each manager had supervised at any given time in his or her career ranged between 4 and 50 (median: 8 analysts).

Participants for this study were not selected randomly. Rather, managers with whom the research team had established contact in the past were asked to participate in the interviews. All seven managers that we approached agreed to participate in the study, resulting in a perfect response rate. Initial contacts with the managers had been established through the senior author's prior contacts with the interviewees. All of the interviewed managers take an active role in the community and appreciate the potential value of scientific research to their profession. It is unclear whether our sample is representative of the general population of Canadian intelligence managers or only of one of its more active sub-groups. One way to address this methodological issue would be to expand the sample and conduct additional interviews, which is a prospect under consideration by the research team and the project sponsor.

2.2 Procedure

In the course of the study, the research team conducted six in-person interviews. The length of the interviews varied between 1 and 2.5 hours depending on participants' availability and the length of their responses. Five interviews were individual, while one interview was conducted with a group of three participants, one of whom agreed to an individual follow-up interview. The interviews followed a semi-structured format; therefore, there was some degree of variation in the questions posed to different managers depending on individuals' experience with different topics of interest. The topics that were discussed during the interviews included: the organization's intelligence products and processes; challenges that analysts face; skills and capabilities essential to intelligence analysis; selection criteria; training; analytical tools; the managers' roles in intelligence production; and characteristics of the IC at large. The initial list of interview questions is included in **Annex A**. Not all of the questions from this list were discussed with each manager due to the varying length of the interviews and the relevance of the question in light of the interviewee's experience. Given participants' approval, the interviews were audio recorded whenever possible and later transcribed. If an audio recording of an interview was not feasible either due to demands of the facility or personal preferences of a participant, then members of the research team took notes during the interview. The notes were later consolidated and expanded. Interview transcripts or consolidated notes were sent to the participants for review and approval.

The research team analysed the transcripts. The analysed data set consisted of six text documents: four full interview transcripts and two sets of consolidated notes.

2.3 Data and analysis

The interview transcripts and notes were analysed with qualitative data analysis software QSR N6 developed by QSR International Pty. Ltd, Victoria, Australia. Transcript sections from different interviewees pertaining to the same topic were grouped together and summarized for each topic. Although a number of different topics were discussed during the interviews, the discussions mainly focused on analysts' tasks and processes. As an illustration of the amount of attention devoted to each of the topics in the interviews, *Figure 1* shows the distribution of the transcript text among the discussed themes. This representation serves as only a crude approximation since some of the themes overlapped and not all topics were discussed with each interviewee.

Due to the small sample and the semi-structured nature of the interviews, it was difficult to infer reliable differences between the two organizations. Therefore, responses from the IAS and CDI managers were aggregated and only general summaries pertaining to the topics are reported in the following section. We did, however, comment on distinctions between the two organizations that did emerge from the data.

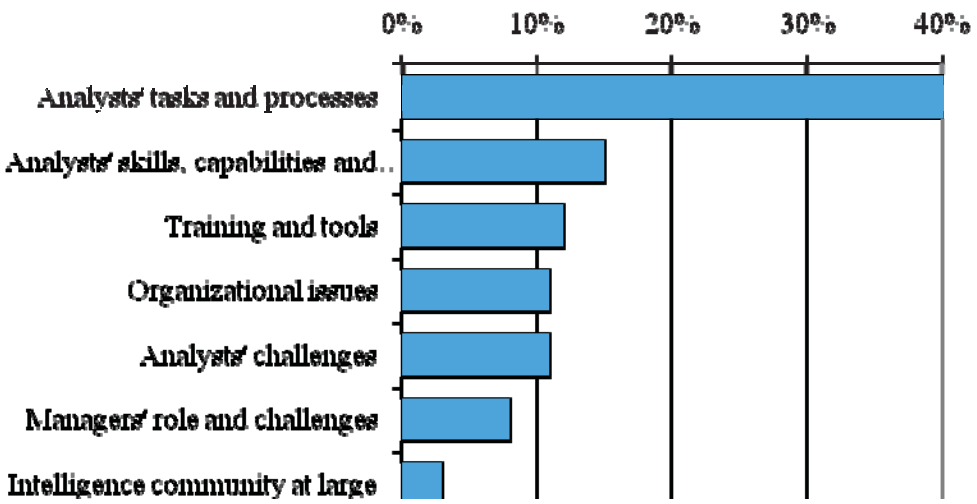


Figure 1: Percentage of transcribed text by theme

3 Summary of the Interviews and Discussion

This section summarizes interview findings and discusses them in light of the intelligence analysis literature. The discussion is organized around the interview themes outlined in *Figure 1*. Issues discussed in this section are also summarized in a Concept Map in **Annex C**.

3.1 Analysts' tasks and analytic process

Challenges that analysts experience are a product of an analyst's task and his or her ability to cope with situational and task demands, as determined by skills, knowledge, and experience. Some of these challenges are inherent in the nature of the intelligence analysis activity itself while other challenges could be due to a particular organizational environment. In Sections **3.1** and **3.2**, we summarize our discussions with managers regarding the nature of analytic tasks, processes, products, organizational environment, and resulting challenges. Section **3.3** focuses on analysts' skills that are essential, according to the managers, to performing the tasks and coping with challenges.

3.1.1 Analysts' tasks

Results. All managers commented that intelligence analysts in their organizations engage in a variety of activities. While the specific activities may differ for analysts in IAS and CDI, the general categories of tasks are similar. According to the managers, analysts' activities include preparing intelligence reports, providing support to operations, providing situational awareness briefings to senior leaders, liaising and interacting with the rest of the IC, fulfilling bureaucratic requirements such as attending meetings and briefings, and providing warning intelligence, often in the form of probabilistic judgments of events occurring.

Discussion. As managers indicated, intelligence analysts perform a number of activities, of which analysis is only one. Intelligence analysis itself involves a broad range of activities. Treverton and Gabbard (2008) described a pyramid of analytic tasks, which includes five levels of processing information from "raw" data to finished products, and each of the levels requires different skills and tools. Naturally, not all of these tasks are completed by a single person. Analysts at IAS mostly perform strategic intelligence analysis while analysts at CDI mostly engage in medium- to short-term operational analysis. In both organizations, analysts usually do not collect or analyse "raw" data themselves, as they mostly deal with information that was collected, evaluated, organized, and coded by others. For example, an all-source analyst might use imagery intelligence data that was interpreted by a specially trained imagery analyst, or they may use a media report for which information was selected, processed, and presented in a certain way by the producers of the report (Butler et al. 2004, Pritchard and Goodman 2009). Our interest and discussions focused mostly on the issues related to conducting all-source intelligence assessments and preparing analytic reports. The following subsections examine the analytic processes.

3.1.2 The "Intelligence cycle"

Results. Conducting intelligence assessments involves a variety of activities, including: defining the topic and the analytic questions; conducting information searches; evaluating, interpreting, integrating, and analyzing information; making judgments; and communicating the final assessment. The intelligence production process is often conceptualized as a five-stage cycle (see *Figure 2* for an example of the intelligence cycle). However, some managers commented that the actual process is not as straightforward as it appears from the cyclic model. As one interviewee stated:

> *There is a process [the intelligence cycle]; it is a theoretical process. The implementation of it is something completely different … . There is a big difference between what should be done and what they [analysts] are all taught to do, and actually what they are able to do at any given time.*

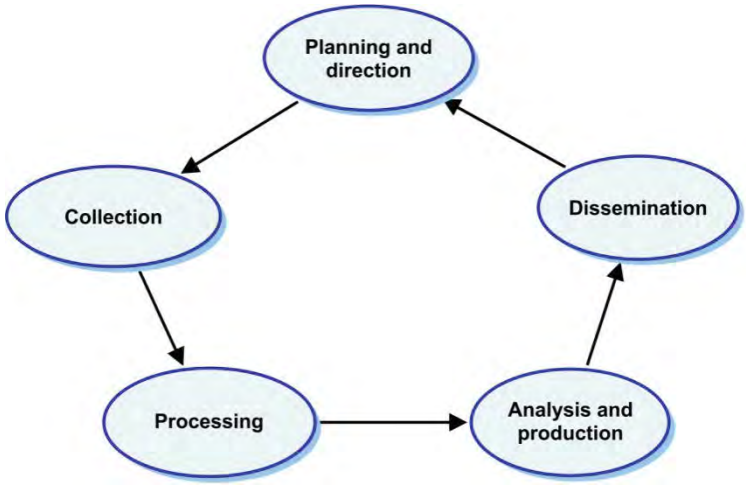


Figure 2: The Traditional Intelligence Cycle, from Johnston (2005)

Nevertheless, some managers see the intelligence cycle as a helpful model for teaching intelligence production processes:

> *The intelligence cycle is not an accurate depiction of how things are actually done, but it's a broadly useful framework.* (Interviewee)

Discussion. The intelligence cycle model of the intelligence production process originated in the military context and was adopted by the civilian community (Herman 1996). The military intelligence cycle is a simplified prescriptive model of a complex process, with emphasis on a linear sequence of events and processes (Herman 1996, Johnston 2005). The civilian IC does not have its own formal intelligence doctrine and it adopted the military intelligence cycle as an accurate description of the process. The model is based on the notion that the whole process is

driven by user requirements (Herman 1996). Although the cycle idea is “deeply ingrained” in the community (Treverton 2001), our interviewees echoed some of the criticisms this model has received in the literature. These are described below.

One challenge to the model is its assumption that the intelligence production process is driven by consumer requirements (Herman 1996, Hulnick 2006, Treverton 2001). However, intelligence consumers may not always be able to articulate their needs. In some cases, they may be aware of pertinent issues but lack the time or patience to formulate well-structured queries to the IC. In other cases, policy makers may have limited awareness of pertinent issues, and, in such cases, the IC must bring them to the decision makers’ awareness. Thus, even in instances where intelligence production is policy directed, the intelligence community will likely play an important role in defining and refining the questions. Contrary to the model, the process “is driven by intelligence ‘pushing’ rather than policy ‘pulling’ ” (Treverton 2001, p.106). Former National Security Advisor to United States (US) Presidents Gerald Ford and George H. W. Bush, Lt. Gen (Ret.) Brent Scowcroft, endorsed this view in a reply to a question posed to him at a recent National Academy of Sciences public workshop on intelligence analysis. Scowcroft was asked whether the bulk of intelligence was pulled by policy makers or pushed by the IC, to which he replied “... I would say, predominantly, it is the flow from the intelligence community to the decision maker” (see Scowcroft 2009, for the link to the audio recording of his comments).

Another critique of the intelligence cycle model is that it oversimplifies the process and does not include all aspects of the intelligence function, such as counterintelligence and covert action (Hulnick 2006). All models are simplifications of the phenomena they are intended to represent, and although there is value to be gained from some simplification, too much can obscure important attributes of the phenomena. The intelligence cycle model captures key elements of the production process, but does not articulate in any detail the composition of these main elements. A benefit of excluding such details is that the model can be applied to many intelligence organizations and across the tactical – strategic continuum. A highly specified model would not apply across intelligence organizations because processes vary widely among (and even within) organizations. A drawback of the model’s over-simplification is that it may do little to facilitate analysts’ understanding of their responsibilities and challenges (Johnston 2005). The neat cyclical representation also has been criticized for not realistically representing the serial and parallel nature of the flow of operations in intelligence production (Herman 1996, Johnston 2005, Treverton and Gabbard 2008). Stages in the cycle (e.g., collection and analysis) might overlap rather than being clearly distinguished as implied by the model (Treverton and Gabbard 2008).

Adjustments to the sequence and contents of stages in the intelligence cycle have been proposed (Herman 1996, Hulnick 2006, Omand 2009, Treverton 2001, Treverton and Gabbard 2008). For example, Herman (1996), Treverton (2001), and Hulnik (2006) highlighted the fact that the real sequence of information flow is more complicated than what is depicted in the traditional intelligence cycle and suggested sub-cycles and shortcuts among the stages. Further, they maintain that some stages (e.g., collection and analysis) run parallel to each other rather than in a sequence. Similarly, Omand (2009) represented the cycle as an interactive network of five components: direction, accessing, elucidation, dissemination, and action-on. The “accessing” stage replaced the traditional “collection” stage, thus highlighting the evolution of availability and access to information since the Cold War. Similarly, “elucidation” replaced “analysis”, putting an emphasis on analysts’ abilities to derive meaning from the information available. “Direction” and

"dissemination" stages remain in Omand's model, but he added a new component, "action-on", to highlight the significance of intelligence in short-term security activities.

Even with the proposed changes in the flow and content of the cycle's stages, the adjusted versions of the intelligence cycle represent a collection of five or so interconnected steps, which still fail to capture and communicate the underlying complexity of the real process (e.g., Johnston and Johnston 2005). Johnston and Johnston (2005) proposed a more significant elaboration of the intelligence cycle with a systems model of the process (see *Figures 3* and *4*). This model of throughput of intelligence products incorporates a significant number of factors and provides a greater level of detail and appreciation of the complexity of the intelligence production process. The model suggests that an analyst's ability to produce is affected by a variety of factors. Some factors are internal to the analyst (e.g., capabilities), some are properties of the product (e.g., complexity of a document), and some are characteristics of the task setting (e.g., political and cultural values of an organization). Despite its elaboration on the traditional model, Johnston and Johnston's model does not identify the types of personnel involved in the process and so it is unclear who is responsible for each task and process. Further, it assumes that the process begins with consumer requirements and follows a predefined sequence; these concerns mirror those of the traditional cycle discussed above.

The Components of the Systems Model

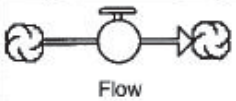
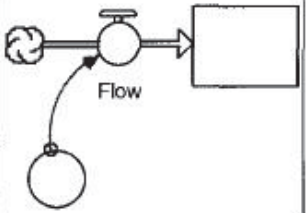
Icon	Purpose
Stock 	***Stocks*** represent accumulations. These are quantities that can increase or decrease, such as the amount of work that needs to be completed, the time available in which to do it, experience one might bring to a task.
 Flow	***Flows*** represent activities. They control the filling or draining of stocks, causing conditions to change.
 Converter	***Converters*** change inputs into outputs. They usually represent the variables that initiate change. In the example, a converter might represent a sudden and drastic world event.
Stock  Flow Converter	***Connectors*** link elements to other elements, representing assumptions about what depends on what.

Figure 3:The components of the systems model of the intelligence cycle (Johnston and Johnston 2005)

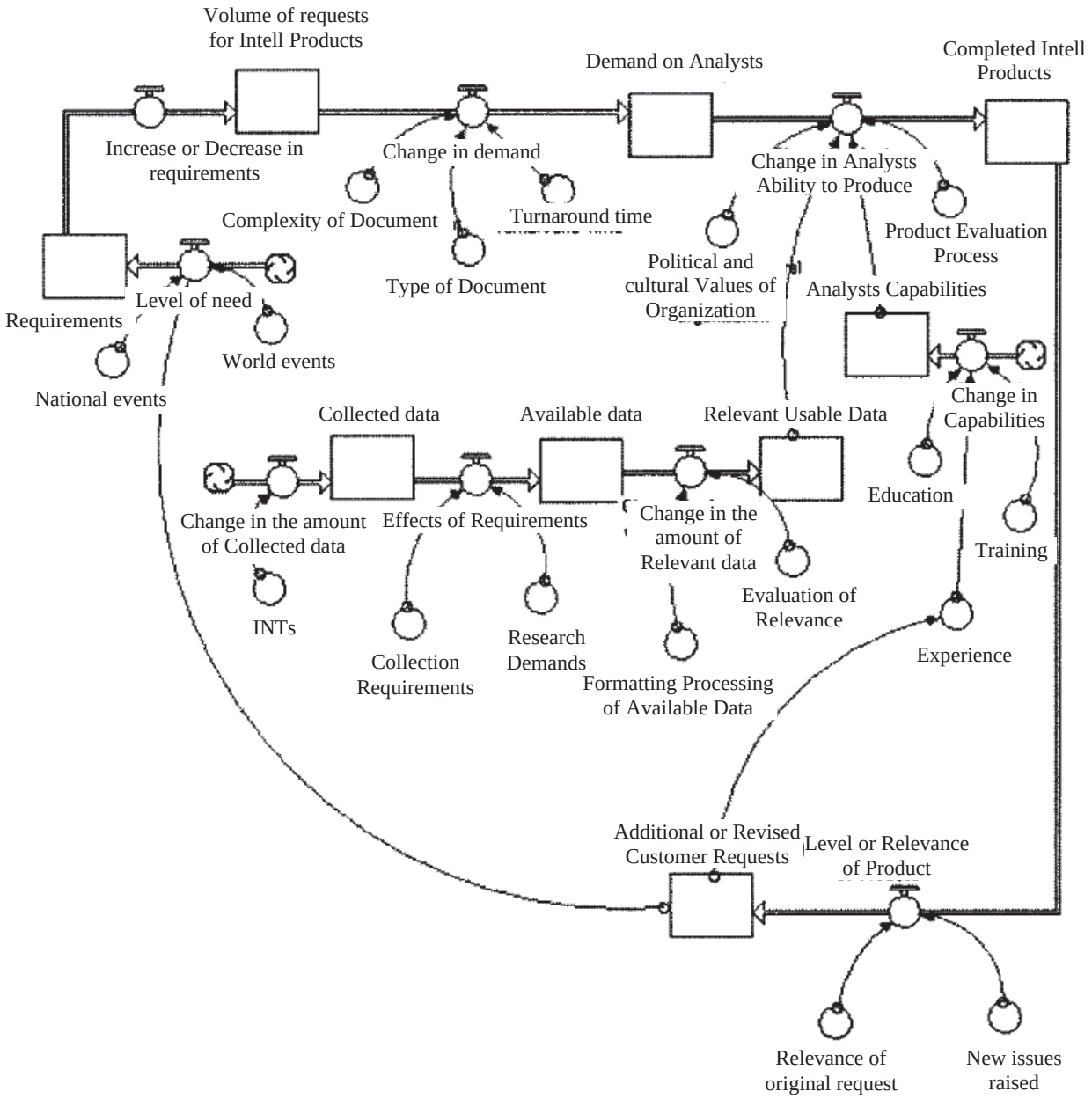


Figure 4: The systems model of the intelligence cycle according to Johnston and Johnston (2005)

As indicated earlier, models serve to simplify phenomena and, thus, inevitably omit some aspects and highlight others. Appropriate models may be useful frameworks for discussion and for

highlighting important aspects of underlying phenomena. However, it is the context and purpose of the model's application that determines which aspects are important. Different models of the same phenomenon may be created in order to draw attention to different features. For example, it may be useful to provide students in an introductory intelligence analysis course with a simple model that represents the intelligence process (e.g., the traditional intelligence cycle with some modifications) but the same model may be ineffective for discussing contingency variables in the process (for which a systems model may be more appropriate). Any model of the intelligence process is bound to be incomplete; the question is whether or not a given simplified representation provides an advantage to the analyst. Johnston and Johnston (2005) accurately state that "the traditional intelligence cycle model should either be redesigned to depict accurately the intended goal, or care should be taken to discuss explicitly its limitations whenever it is used" (p.55). We would add that revisions to the model should depend on the purpose for which it is intended.

3.1.3 Uncertainty

Results. Uncertainty is one of the inherent characteristics of intelligence analysis.

> *The problems the analysts are dealing with are usually not structured. There is a lot of uncertainty…* .(Interviewee)

In our discussions, some managers identified degree of uncertainty associated with a particular analytic topic as one of the major determinants of difficulty in preparing an intelligence product. An ability to cope with uncertainty was also identified as one of the essential skills required of intelligence analysts.

Discussion. Conceptually, intelligence analysis is the business of reducing uncertainty based on available information and reasoning. Thus, uncertainty is one of its fundamental characteristics (Davis 1992, Heuer 1999, Lefebvre 2004). In a somewhat simplistic manner, the analytic process can be conceptualized as an open system (Katz and Kahn 1978) with inputs, a transformation process, and outputs (*Figure 5*).

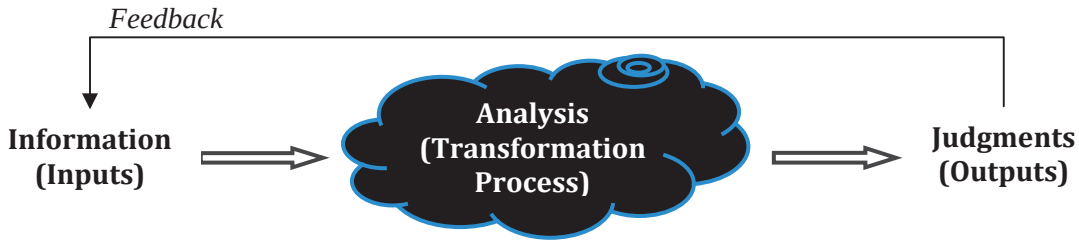


Figure 5: Systems view of the analytic process

In this system, collected information, analysts' knowledge, product requirements, and feedback from the environment (i.e., consumers) constitute *inputs*; manipulation of the inputs or the

process of analysis and product development constitute the *transformation process*; and the resulting analytic product and judgments constitute the *outputs*.

In intelligence analysis, uncertainty is present in all three of these element-blocks of the system.

- ***Inputs***: Several sources of uncertainty exist at the level of inputs:
  - As quantity of available information increases, the difficulty in detecting signal within noise also increases.
  - Analysts do not always have the means to determine whether or not they have sufficient information to terminate their searches, and are often uncertain regarding the relative value of gathering additional information.
  - Due to gaps in available information, analysts have to supplement missing information with judgments.
  - Inaccuracy of information, which may be due to deliberate deception or misinterpretation of data during processing.
  - Product requirements (i.e., analytic questions to be answered by a report) are often ambiguous, and they also constitute inputs to the system.
  - Feedback from the environment is an input to the system that is crucial for the system's ability to adjust. Some managers commented that there is a lack of feedback from consumers regarding the impact of intelligence products, which contributes to uncertainty about product requirements.
  - Stringent time constraints, which limit the analyst's capacity to thoroughly search for and collect information, might also increase input uncertainty.
- ***Transformation process***: The process of analysis involves making sense of information and drawing inferences. The uncertainty of the transformation process in intelligence analysis is due in part to the uncertainty associated with quality and completeness of the inputs (i.e., "garbage in, garbage out"); and it is also the case because analysis relies largely on human reasoning and decision making. The latter – although superior to artificial intelligence in dealing with uncertainty – is still far from being a flawless process. Decades of research in the area of judgment and decision making have shown that human reasoning naturally relies on cognitive heuristics, and is susceptible to bias and error (e.g., Gilovich et al. 2002, Heuer 1999, Kahneman et al. 1982). Davis (1992) pointed out that complexity, uncertainty, and time pressure of intelligence analysis increase analysts' reliance on mindsets, defined as "distillation of the intelligence analyst's cumulative factual and conceptual knowledge into a framework for making estimative judgments on a complex subject" (p.33).
- ***Outputs***: Outputs of intelligence analysis are generally judgments with respect to future states or events. "*Intelligence analysis is a business of forecasting, predicting the future …*." (interviewee), and a certain degree of uncertainty and possible misjudgements are inherent in intelligence assessments (Brady 1993, Heuer 1999).

In short, uncertainty will always be a fundamental feature of the intelligence process, and efforts to manage it more effectively ought to be sought. Despite the intuitive appeal of collecting additional information to resolve uncertainty, this strategy may not be effective or feasible: necessary information may not exist, the information may be unattainable or unreliable, or

requirements for search and collection may exceed the time available. Lefebvre (2004) suggested that uncertainty "… can be reduced with the use of logic, relevant methodologies, analytic techniques, and better collection" (p.248). Some scholars have suggested using analytical imagination (i.e., envisioning alternative hypotheses or explanations) to compensate for informational gaps and better direct search and collection efforts to reduce uncertainty (Bruce 2008, Pritchard and Goodman 2009). Although imagination may reduce uncertainty in some instances, generating additional plausible explanations might cause additional uncertainty especially when the available evidence does not allow rejecting alternative explanations.

3.1.4 Deciding what to analyse (topic selection for analytic products)

Results. The main outputs of intelligence analysts' activities are intelligence assessments in the form of written reports (e.g., summaries and memoranda) and briefings to military commanding officers and government officials. There are several types of reports produced, which vary in their focus, length, intended audience, publication frequency, time horizon, and complexity. As noted earlier, analytic products produced by the two organizations we sampled – namely, CDI and IAS – differ in scope and time horizon.

Managers' opinions varied with respect to the main goal of analytic reports – some managers saw the main goal of the reports as making judgments and predictions, while other managers saw the main goal of the reports as providing situational awareness but not predictions. However, despite this difference in emphasis, managers agreed that analysts have to make predictions in most analytic assessments.

Before analysts can begin working on generating an intelligence product, however, a certain topic or set of intelligence questions for that document have to be identified. The intelligence cycle indicates that requirements are generated by the consumers. However, most managers indicated that both managers and analysts take an active role in setting specific requirements for an assessment. Managers from both organizations indicated that general directions for analytic products are set by senior leaders, but the specific foci of the reports are negotiated among an analyst, his or her manager, and, sometimes, the client.

> *Very rarely do we get very specific questions from clients, so what we have to do is try and second guess but be aware of what the policy concerns are among our clients so that we can identify those questions. … It's an interactive process between me and my analysts in setting up priorities. … We have to keep focused on our clients, but the clients' needs are broader than the questions they articulate today. ... There is no formal process in identifying the issues but I encourage my analysts to be in close contact with the clients. Sometimes there is a negotiation about a question because the question that the client is asking is not really the question they are really interested in. This is what they think they are interested in and it could be something we cannot do much with, but a slightly different version will give us sufficient flexibility. It is often a negotiation process and we work it out with the client.* (Interviewee)

Managers play an important role in setting the foci for the intelligence products and in formulating analytic questions, but analysts also have input into this process. Some managers commented that IAS analysts have more flexibility in topic selection than CDI analysts, perhaps

due to the difference in scope of the assessments between the organizations – IAS focuses on long-term strategic analysis, and CDI focuses on more short-term operational analysis, the latter of which may have more specific foci at the outset. In addition, IAS analysts usually begin developing topics for potential products before they are officially assigned to producing a particular report, while CDI analysts mostly have to address their clients' immediate needs.

Discussion. Given that the main goal of intelligence assessments is to provide a better understanding for decision makers (Herman 1996, Treverton 2001), it is not surprising that two key functional aids to decision making were emphasized in the interviews – improving situational awareness and offering predictive judgments. These two functions roughly correspond to different temporal foci, both of which may play a key role in improving decision making. Situational awareness provides the decision maker with knowledge about the state of the world in the area of interest in the recent past and the present. Of course, the difference in the way managers prioritize intelligence objectives may also reflect differences in the requirements with which their respective organizations or offices are tasked.

Because analysts produce intelligence to support policy makers and commanding officers, it is crucial that their products are relevant to, and satisfy, their consumers' needs (Herman 1996, Treverton 2008). Selection of intelligence questions to be answered by an intelligence product is closely related to the analyst's (and manager's) ability to identify consumers' needs. Ideally, intelligence consumers would clearly specify their intelligence requirements. However, as some managers have pointed out, and as discussed in the previous section, this is rarely the case. Intelligence consumers are not always able to clearly specify their intelligence requirements, or when the consumers are at last able to articulate their requirements, there may not be enough time left for collection and analysis to answer consumer's questions. In addition, consumers do not always have a good understanding of intelligence capabilities and what intelligence analysts can and cannot do (Herman 1996). This disconnect creates on the one hand, the need for intelligence producers to anticipate what consumers may want in the future and develop their collection and understanding accordingly (Hulnick 2006, Treverton 2001); and, on the other hand, it creates the need for negotiation with consumers in an attempt to arrive at a common understanding of the requirements and realistic expectations. Indeed, "… there must be good communication between policy consumers and intelligence managers if intelligence is to be on target and meet the needs of decision makers" (Hulnick 2006, p.968).

Although it was not raised by managers that we interviewed, in the complex consumer - producer relationship there is always a risk of consumers pressuring intelligence personnel to deliver products that conform to consumers' pre-conceived views (Gardiner 2009, Hulnick 2006). An example of intelligence yielding to such pressure are the infamous estimates on WMD that were used as justification by the administration of US President George W. Bush to invade Iraq in 2003 (Hulnick 2006, Treverton 2008), although the role that this pressure played among other factors in the resulting intelligence failure is still debated (Jervis 2009). Many writers agree that intelligence producers need to be in a closer relationship with consumers to ensure that products are relevant and that they address consumers' needs more effectively (Davis 1995, Gardiner 2009, Medina 2009). However, the IC is faced with the dilemma of how to bring analysts closer to consumers while avoiding politicization[1] of intelligence (Gardiner 2009, Treverton 2008).

[1] *Politicization* of intelligence refers to distortion of analysis resulting from pressure or willingness to satisfy demands of intelligence managers or consumers. Treverton (2008) differentiates among five forms

3.1.5 Assessment's difficulty

Results. There are a variety of intelligence products that intelligence organizations create, and even products of the same type (e.g., intelligence memoranda) might vary greatly in their level of difficulty. The main factors mentioned by managers that contribute to an assessment's difficulty include:

- The topic: The nature of the issue being analysed and the number of aspects that need to be considered affect difficulty. For example, analysing an issue for a region that consists of several countries is usually more difficult than analysing the same issue for a single country.
- Time horizon: The more forward-looking the report, the more uncertainty an analyst has to manage.
- Amount and quality of available information: Large quantities of information, especially when coupled with low evidential quality (e.g., low source credibility or information reliability) contribute to the difficulty of an assessment. It requires more time and effort to search through large quantities of available information in order to find that which is not only relevant but is also reliable. It may be practically impossible to review everything that is relevant to a topic in a limited amount of time, which contributes to analysts' uncertainty regarding the potential existence of other useful information that was missed in the initial search. To cope with this uncertainty, some analysts may prolong their information-gathering at the expense of analysis. Some participants also noted that a large quantity of available information does not ensure sufficient *reliable* information for testing considered hypotheses. As a result, analysts may feel pressure to fill information gaps with analyses and judgment.
- Available time: Stringent timelines increase the difficulty of assessments.
- Background knowledge: If analysts lack background knowledge on an issue being analysed, the difficulty of the task increases.
- The level of analytical assessment required for the report: Simply summarising information coming from different sources is easier than performing a deep analysis of an issue or trend, and providing an explanation or judgment.

Discussion. Managers commented on several sources of difficulty in making intelligence assessments, which may be organized into three general groups of factors:

- individual characteristics of analysts (e.g., their background knowledge),
- inherent properties of the task (e.g., the specific issue being analysed), and
- the environment in which the assessment is carried out (e.g., the amount and quality of information and time constraints).

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of politicization: "Direct pressure" from policy officials; a "House line" – pressure coming from analytic office; "Cherry picking" – policy makers pick "convenient" assessments among those available; "Question asking" – framing of the question affects the answer; and "Shared mindset" – where intelligence and policy share strong presumptions. For a detailed discussion see Treverton (2008)

One way of summarising the points raised by managers is to say that the difficulty of a task is a function of the analyst's individual characteristics and the environment in which that task is performed. We would add that the interactions between person and environmental factors are also central to understanding objective and perceived task difficulty. Indeed, that most of human behaviour is the product of person × environment interactions is one of the foundational insights of social psychology (Brunswik 1943, Heider 1958, Lewin 1935). The analyst's environment, in this sense, includes the task itself, which has a certain degree of complexity, and the setting in which the task is performed, which includes available resources, processes, expectations and relationships with other individuals. The analyst's motivation, skills, knowledge and experience influence how the task is perceived in a given context. For a discussion of an extended set of variables that play a role in intelligence production, see Johnston (2003, 2005).

All three aspects – inherent properties of the task, task setting, and individual characteristics of analysts – have been discussed in the intelligence literature. For instance, inherent properties of analytic tasks are used to classify intelligence problems into puzzles, mysteries (Treverton 2001) and messes (Thompson 2010). Puzzles are intelligence questions that have clear boundaries and a definitive answer given the availability of certain reliable information. Mysteries, while still having clear boundaries, do not have a definitive answer regardless of the information available. Messes have neither correct solutions nor clear boundaries, making it difficult to define a solution state (Thompson 2010). The emphasis in this classification is placed on task complexity, which is determined by the existence of the "correct" answer and the availability of resources (e.g., information). Resource availability is part of the setting in which the task is performed. Jones (1998) and Krizan (1999) described a more elaborate taxonomy of intelligence problems along the dimension of uncertainty. They differentiate among five problem types: simplistic, deterministic, moderately random, severely random, and indeterminate. Each problem type is further described along a set of characteristics such as role of facts, role of judgment, analytical task, analytical method, and probability of error. For example, the role of facts for the five problem types decreases as we move from simplistic to deterministic to moderately random and so forth, and the role of judgment and probability of error increases (see **Annex B** for the complete taxonomy). Assessments that analysts at CDI and IAS perform most of the time seem to be intelligence mysteries (or, perhaps, even messes) rather than puzzles that fall within the range of "moderately random" to "indeterminate" based on Krizan's taxonomy. Problems characterized by high uncertainty rely more on human judgment, and are associated with a higher probability of error (than problems with low uncertainty), and are concerned mainly with predicting future events and situations. Although Krizan did not make the mapping between this taxonomy and task difficulty, it is reasonable to associate the uncertainty of a task with its difficulty. Krizan suggested that her model might enable decision makers and analysts to articulate a particular scenario and to assess the capabilities needed to solve the problem. The model offers a structured approach to classifying and characterising intelligence problems based mostly on properties of the task. Although the model may be a useful theoretical approach to differentiate among intelligence problems, its practical utility remains to be determined.

A number of issues related to the task setting have been discussed (Johnston 2005, Pritchard and Goodman 2009, Treverton 2001). For instance, Hedley (2007) and Treverton (2001) noted that the constantly increasing amount of available information creates data overload for analysts and blurs the distinction between analysis and collection. Some practitioners have observed an overall trend of increasing scope and complexity of intelligence issues in the post Cold War era (McLaughlin 2008). Treverton (2001) further observed that an increase in the number of possible

security concerns implies that analysts may be faced with a greater variety of topics and, as a result, may have limited opportunity to specialize. Heightened public attention to the intelligence function after the terrorist suicide attacks on the US on 11 September 2001 (9/11 attacks), and the Iraqi WMD failures puts intelligence analysis in the spotlight of public and political attention, which creates additional pressure for analysts (Bruce and George 2008, Lowenthal 2008). In addition, organizational product evaluation processes may impose additional time limitations on analysts (Johnston 2005).

Discussion of the professionalization of intelligence analysis has sparked interest in the individual characteristics – abilities, skills, and knowledge – required of analysts to effectively carry out their tasks (Krizan 1999, Moore and Krizan 2003). However, discussion of environmental and individual factors in intelligence analysis has mostly been fragmented and focused on specific areas of interest. A unifying view of all of the issues involved has not been provided with the exception of the systems model of Johnston and Johnston (2005) of the intelligence cycle discussed in Sub-section **3.1.2**.

3.1.6 Information dependence

> *Conducting intelligence analysis is like trying to solve a jig-saw puzzle without having the final picture and no certainty that you have all the pieces.* (Interviewee)

The jigsaw puzzle analogy of intelligence analysis offered by several of our interviewees, and used in the literature to describe intelligence (e.g., Johnson 2007), highlights the dependency of analytic activities on the information available. This analogy implies that analysts have to reconstruct a comprehensive picture of a situation from segregated pieces of information. Analysts deal with a dynamic world and their understanding of the unfolding events relies heavily on the information available (Bruce 2008). Information processing is one of the predominant activities in intelligence analysis. It includes information search, interpretation, evaluation, and selection (i.e., of relevant information for a particular analytic problem). Analysts rely on different sources of information and, most of the time (if not always), have to sift through a massive amount of available data to extract relevant and useful information for their purposes (Hedley 2007, Johnston 2005, Pritchard and Goodman 2009, Treverton 2001, Woods et al. 2002). In the following subsections, we discuss managers' comments regarding the sources of information available to analysts, the process of information evaluation, and the role that classification level plays in information selection.

3.1.6.1 Information sources

Results. Analysts in CDI and IAS do not collect "raw" intelligence themselves, but draw on open and classified information available from various sources (e.g., open-source information from the Internet and other media, classified analyzed imagery data, collected human intelligence, etc.). Analysts obtain their information mainly from computer information systems and social networks of experts and peers. Broadly speaking, the sources of information that analysts use are:

- Open source, publicly available, information systems such as the Internet, newspapers, television, and radio;

- Specialized computer information systems of varying classification levels, which contain classified information from various sources such as human intelligence (HUMINT), signals intelligence (SIGINT) and image intelligence (IMINT);
- Formal intelligence sharing groups, such as Interdepartmental Experts Groups (IEG); and
- Personal informal networks of peers (consisting of other analysts, experts on the topic, etc.) that an analyst develops over time.

Some managers stressed the significance of the informal networks in information sharing among analysts.

> *There are formal channels for sharing information, for example, ITAC (the Integrated Threat Assessment Centre) but in reality, it's much more informal networks of people who respect each other, who think they are getting value added.* (Interviewee)

Discussion. The nature and quality of information available to analysts play a significant role in determining the accuracy of the resulting intelligence assessments (Bruce 2008, Pritchard and Goodman 2009). In their search for relevant data, analysts rely on the available open and classified information systems which contain large quantities of information, much of which is of uncertain quality. Commenting on the variety of intelligence information sources (e.g., HUMINT, SIGINT, IMINT, etc.), Hedley (2007) observed that "complicating the mix of these sources of intelligence reporting is its sheer volume, its rapid-fire receipt, the ever-present 'noise' of contradictory and inaccurate information, and deliberate deception designed to mislead" (p.213). In addition, the information that is available through different sources and on which analysts rely is not exactly "raw" data, but information that has already undergone a certain degree of processing and interpretation. For example, image data is captured and interpreted before it can be used by an all-source analyst; human intelligence is gathered, evaluated, and reported by intelligence collectors, who themselves often receive information second, third, or even fourth hand (Butler et al. 2004, Pritchard and Goodman 2009, Woods et al. 2002). Every level of processing of information introduces an additional layer of interpretation and potential bias due to limitations of collection instruments, available tools, and human interpretation; "as a result the information that feeds into the subsequent analysis is never an exact representation of reality" (Marrin and Clemente 2005, p.714). Information that analysts use in their assessments is a product of a whole chain of reporting. Thus, analysts may not have direct access to certain individuals to get additional information when needed (Butler et al. 2004, Hedley 2007, Pritchard and Goodman 2009). Analysts' informal relationships with peers, which take time to develop, may allow them to track information down the reporting chain more effectively than may be possible through formal channels.

In addition to the information available through various systems, there is a great deal of social interaction involved in intelligence analysis (Johnston 2005). As some interviewees have pointed out, even though formal channels exist, analysts rely mostly on their informal networks to evaluate and interpret incoming information, negotiate meaning, and to share alternative views.

Despite the advantages of informal networks to provide timely support to intelligence analysts, nevertheless, they pose difficulty from an organizational perspective. The drawback of informal networks is that they are individual-dependent and not role- or position-dependent, and therefore,

are not recorded in organizational memory or supported by organizational procedures. As a result, if an analyst moves to a new position, the person who replaces him or her may not be able to establish a similar network. The effectiveness of informal networks depends on the person's willingness to work collaboratively, which may be determined by individual agendas and the personality characteristics of the participants. Thus, if analysts rely on informal networks, there is little an organization can do to document and influence these networks.

There has been an effort in the US IC to promote the development of working relationships among analysts by creating The Analyst Resource Catalogue that was compiled by The Office of the Director of National Intelligence (ODNI). This catalogue contains some 17,000 analysts and allows users to locate individuals working on specific areas (Tucker 2008). This initiative may make access to other analysts easier (depending on how well it is updated and maintained), but it does not guarantee that a productive and lasting relationship will be established. Such a directory may be a useful way of monitoring capability distribution in the community and may allow faster access to experts. It may also be beneficial for the Canadian IC to explore the utility of undertaking a similar initiative.

3.1.6.2 Evaluation of information

Results. Most managers pointed out that an important step in the intelligence production process is the evaluation of the information upon which analysts rely to make their assessments and judgments.

> *After analysts gather all that information from different sources what they have to do is take all of that information, open and classified at different levels, and they have to bring it all together and distill it. Part of that distillation process would be balancing and weighing evidence as it comes in. It greatly depends on the individual analyst's skill set, guidance and supervision. It's not done in a very formal way.* (Interviewee)

Usually, analysts working on a given subject area have formed a certain understanding of the situation and events. New information that they gather for their assessments might support their theory, challenge it, or show divergent trends. How an analyst evaluates new information will determine whether or not it will be incorporated into his or her analysis and, therefore, might affect the resulting judgments. That is, information might be discarded if it is judged to be unreliable or the source is judged not to be credible. Information collected through various specialized channels (e.g., HUMINT, IMINT, SIGINT) is supposed to be evaluated for reliability and credibility by information collectors or initial information processors. Analysts take these evaluations into account when they assess the information themselves. However, one manager pointed out that intelligence collectors do not always evaluate information sources, and thus accuracy of the information is unclear. Some managers noted that because there is no standard way to evaluate information, the onus is on the analyst to assess its quality and to decide whether to include or exclude it from consideration. The processes that analysts follow in assessing information quality depend, in part, on their experience and skill set.

Discussion. Quality and availability of information are significant factors in producing reliable intelligence. As the quantity of information available to analysts increases, so too does the amount of 'noise' (i.e., irrelevant or unreliable information) and contradiction. In addition to

having to sift through information of poor quality, analysts need to be vigilant to the possibility of deception (Marrin and Clemente 2005). That is, they need to carefully consider the relevance and accuracy of information. Based on a recognized standard in the community, each piece of information is given a rating on two dimensions:

- credibility of the source and
- reliability of the information (e.g., Krizan 1999, ODNI's Intelligence Community Directive # 203 issued in 2007).

Clandestine information is assessed on these dimensions by the information collectors or processors and analysts take this information into account in their own evaluation of the information. When an intelligence assessment is based on a source that is unverified or of low credibility, an intelligence failure may result, such as in the assessment on WMD in Iraq (Jervis 2009, Schum and Morris 2007). Processes and tools have been proposed to improve source and information evaluation methods. For example, Schum and Morris (2007), drawing on the experience from the legal system in evaluating the credibility of witness testimony, described the computer-assisted system, MACE (Method for Assessing the Credibility of Evidence) that provides a systematic way of evaluating the source credibility and the reliability of information through answering a series of questions.

However, as discussed in the previous sub-section, analysts use information that is a product of a (sometimes lengthy) reporting chain. Information reliability and source credibility ratings are (usually) assigned by intelligence collectors and initial processors of that information; analysts do not always have access to the information sources and individuals assigning these ratings. In fact, according to Hulnick (2006), the lack of communication between analysts and collection officers is one of the major problems in intelligence production. Moreover, the ratings provided to analysts are not always accurate because they are not always assigned in a timely manner or, as one interviewee noted, if a given source is used repeatedly, the source's rating may not be updated on a regular basis. Thus, intelligence analysts must sometimes rely on their technical knowledge of the collection processes or of a particular reporting chain to determine the credibility of a source. Informal networks can be helpful in accessing nodes in the reporting chain.

It is worth noting that information evaluation and analysis are highly interdependent, especially when the evaluation is carried out by analysts. Besides assessing the credibility and reliability of information, analysts also employ their understanding of the situation and the presence or absence of corroborating evidence to judge the value of information. Their evaluations determine whether or not information will be considered and if it will affect the assessments. Although not discussed in the interviews, it would be interesting to determine in future interviews whether or not a feedback loop exists between analysts and collectors. That is, analysts' evaluations and use of information (which may be based on different criteria than collectors') could be provided back to collectors to allow them to compare, evaluate, and, perhaps, adjust their own assessments of their information sources and collection strategies accordingly.

3.1.6.3 The role of classification level in information selection

Results. Due to the limited duration of our interviews and the variety of topics covered, we did not discuss in detail how analysts search for information and what strategies they use. However, some managers commented that information search (among other factors) is affected by attributes of the information itself, such as its classification level. These managers raised two main issues with respect to information classification. First, there are no universal guidelines across organizations for assigning a classification level to information, therefore, different organizations may use different guidelines. The resulting inconsistencies in classification practices may potentially over-restrict analysts' access to useful information. Second, some managers noted that analysts tend to be over-reliant on secret (vs. open) information in their assessments, perhaps because classified information, being more exclusive, attracts the attention of intelligence consumers.

> *Analysts might well generate a similar product from open-source data only, but reference to secret information appears to draw attention to, and increase credibility of, the reports.* (Interviewee)

Discussion. Our interviewees pointed out that classified information attracts more attention and consideration from analysts and consumers. However, level of classification may or may not correspond to the value and quality of information. For instance, a piece of information from a HUMINT source may be classified and, at the same time, be unreliable, especially if the intelligence collector has not properly assessed its credibility and reliability.

The tendency to evaluate the importance of evidence based on its classification level is not unique to the Canadian IC, as it was also observed in the US (Johnston 2005, Lieberthal 2009, Treverton 2001). Classified information, due to its exclusivity, may create an impression of importance. It is also believed to have more face validity than information available through open sources (Johnston 2005). The root causes of this phenomenon are unclear. For example, Treverton (2001) suggested that overreliance on secret information within the IC may be a heritage of the intelligence practices during the Cold War era. He suggests that during that period, most of the useful information came via special and classified channels due to the closed nature of the adversary. However, we suspect that the tendency to overinflate the value of classified information, which we have termed the "secrecy bias" (see McLellan et al. 2008) , reflects more general features of human information processing and judgment. That is, much like representativeness and availability may be used heuristically as proxies of subjective probability (for overviews, see Gilovich et al. 2002, Kahneman et al. 1982) so might the secrecy of information be used as a proxy for its importance or probative value. Scientific research might help to provide a better understanding of the nature of this putative phenomenon and ways to counter its effects should it be shown to be a basis for judgments of evidential importance in intelligence analysis.

3.1.7 Analysis

Results. Selected bits and pieces of information are used by analysts to answer pertinent intelligence questions of their assessments. Managers from both organizations commented that the process of intelligence analysis is not guided by formal procedures but rather relies mostly on the individual analyst's approach and preference.

> … *essentially the approach of analysis across the community is the intuitive approach: you read a lot, sit down, and write.* (Interviewee)
>
> *Processes of analysis are part custom and part rules. There are no standard procedures for conducting intelligence analysis.* (Interviewee)

According to some of the managers, there is no one common, agreed-upon methodology that can be formalized and taught to analysts. Through a number of training sessions, analysts are exposed to various analytic tools and techniques aimed at systematising the analysis process. However, the application of these methods requires additional time investment, is not often re-enforced by organizational procedures, and is largely at the discretion of analysts. In addition, several CDI managers commented that not much attention is devoted to the analytic process in their organization because priority is placed on the outcomes rather than on the process.

> *There is no formal process that analysts follow in terms of methodology, and each analyst approaches it slightly differently. The focus is on conclusions, and not a lot of time is spent on thinking about the analytical process.* (Interviewee)

Some managers also expressed their concern over the quality of the analytical process.

> *My feeling is that too often in the intelligence community, judgments are made too often without rigorous thought.* (Interviewee)

Discussion. Along with information search and evaluation, analysis of the information is one of the key activities in the intelligence process that analysts carry out. Analysis is the process of evaluating and interpreting evidence, piecing together (sometimes seemingly unrelated) information, generating explanations and alternative hypotheses, critically examining those hypotheses, and making judgments. Intelligence analysis is predominantly a mental activity (Heuer 1999) and is the key process in arriving at intelligence judgments. Indeed, "it is by thinking that analysts transform information into intelligence" (Moore and Krizan 2003, p.113). In the context of intelligence analysis, the analyst's thinking is largely an unobservable process, which does not leave a traceable path, unless the analyst deliberately keeps a record of his or her train of thought. Most of the time, only the outcome of analyst's thinking will be evident in the form of judgments or arguments recorded in the final report. Therefore, it is not surprising that efforts to evaluate and improve intelligence tend to focus on more tangible outcomes and processes, such as descriptions of the quality of underlying sources, proper expressions of uncertainties, and the use of alternative analysis. Although these measures are intended to direct and, perhaps improve analysts' thinking, they do not directly capture analysts' mental activity and the train of thought that goes into undertaking an intelligence assessment.

Although intelligence analysis has not received much attention in the scientific and practitioner literature, it has attracted public attention in recent years. Johnston (2005) pointed out that "the Intelligence Community, in its culture and mythos and in its literature, tends to focus on intelligence *operations* rather than on intelligence *analysis*" (p.17, emphasis original). Similarly, Bruce and George (2008) noted a relative shortage of literature devoted to intelligence analysis. Johnston shares the view of Marrin and Clemente (2006) who observed that "intelligence analysis

has historically been practiced more as a craft reliant on the intrinsic skill and expertise of the individual analysts than as a highly developed profession" (p.642). Johnston further suggested that the lack of substantive attention to the process of analysis is (partially) responsible for the lack of formal analytic processes accepted and practiced in the community.

In the current situation, analysts, perhaps with their managers, subjectively determine appropriate approaches and methodologies on a case-by-case basis and strive for analytic rigour based on their own understandings of what constitutes analytic rigour. This subjective approach to methodology application may be the only viable currently available alternative to deal effectively with the variety and complexity of analytic problems. However, managers' concerns regarding the suboptimal quality of analysis in part also may be due to this approach. That is, the absence of standard procedures, diminished attention to the analytical processes, and pressure to produce the final report may lead to cognitive shortcuts and leaps in reasoning, which in turn result in inferior intelligence products. Quality of analysis was also one of the most frequently mentioned concerns by analysts and managers in the study by Treverton and Gabbard (2008) of the US intelligence community.

The lack of formalized analytic procedures is not unique to the Canadian community. Johnston (2005) observed a similar situation in the US community, pointing out that methods employed in analysis are traditionally referred to as "tradecraft," which implies that "the methods and techniques of analysis are informal, idiosyncratic, unverifiable, and perhaps even unexplainable" (p.18). Johnston further suggested the need for documenting, formalizing, and validating analytic methods used in the community. It is worth noting that certain steps in documenting and formalising various analytic methods have been undertaken – see, for example, collections of analytic techniques recently published by the Canadian CDI (Thompson 2010), US Central Intelligence Agency (CIA 2005, 2009), and the US Defence Intelligence Agency (DIA 2008). However, efforts to validate analytic techniques objectively have been scarce[2] and this issue remains pertinent to the present research project.

Whether or not it is possible and beneficial to methodically structure the analytic process remains an open question. However, the study of current practices, and validation of new and existing analytic methods, certainly has merit for determining their utility.

3.1.8 Communication

Results. Most managers stressed the opinion that effective communication is crucial in intelligence analysis. Consumers of intelligence assessments have multiple demands on their attention, and they have limited time to attend to intelligence reports. Managers stressed that it is crucial for analysts to be able to communicate effectively and efficiently. Because decision makers' time is scarce, analysts need to be able to extract key judgments from reports and present these clearly. Some managers also indicated that the ability to communicate effectively is more important to successful intelligence production than fluency in various analytic tools and techniques.

[2] Certain aspects of the Analysis of Competing Hypotheses (ACH) technique have been subjected to scientific scrutiny (see Folker 2000, Cheikes et al. 2004, and Pirolli 2006). However, the results of these studies are inconclusive.

> *Communication is the core of our business. An analyst has to have those communication skills. It doesn't matter how smart the person is, if you can't communicate it will be very, very difficult. Intelligence is not done for personal benefit, it is done for someone else's benefit, and an analyst has to be able to communicate; it's a critical element.* (Interviewee)

Some managers also commented on the role of language in analysis. The choice of words to convey the results of an assessment determines the meaning being communicated. For instance, adjectives and qualifiers used in vernacular in fact are statements of judgment in intelligence reports and convey intended or unintended meaning. Some managers stressed that analysts have to be cautious in selecting appropriate words to express the intended meaning, and the challenge for them is to be able to back up all of their judgments with sound logic and evidence while avoiding unfounded information.

> *Reports are a description/narrative that provide context and try to simplify reality as much as possible. Subtleties of text such as word usage, metaphors, and adjectives are all very important and provide colour to a report… I see intelligence analysis as a craft close to literature. Words matter, style matters*. (Interviewee)

Some managers also commented on the difficulty with communicating uncertainty and confidence of judgments in analytic products.

> *There is a huge problem of language used to convey probability and importance/magnitude in terms of what the expressions mean to different people.* (Interviewee)

Recognizing the vagueness of language and the difficulty it creates for communicating uncertainty, one manager pointed out that a division at IAS uses numerical probabilities to communicate judgment uncertainty; numerical probabilities are subsequently mapped onto a defined set of verbal probability equivalents in the final reports.

Discussion. Communication is an integral part of intelligence analysis, as without communication the results of intelligence assessments could not be conveyed to decision makers. The necessity to communicate effectively is one of the widely recognized requirements for intelligence analysts (e.g., Gardiner 2009, Hedley 2007, Moore and Krizan 2003, ODNI 2009). Communication skills is one of the six performance elements for intelligence professionals in ODNI's Intelligence Community Performance Standards (ODNI 2009). An analyst could perform a state-of-the-art assessment leading to very important outcomes. However, if the analyst cannot effectively communicate the results of his or her assessments and their significance, the work would be in vain at best, and might result in an intelligence failure (Moore and Krizan 2003). Furthermore, Gardiner (2009) suggests that effectiveness of communication also depends on how the analyst's reporting style fits consumer needs. Gardiner suggests that the style needs to be tailored to each consumer's preferences to ensure better product reception. Therefore, analysts may need to be able to vary their reporting style to augment communication effectiveness.

Effective communication of uncertainty that an analyst has with respect to his or her judgments is crucial for conveying the intended meaning (Kent 1964). Verbal terms to denote probability

(e.g., “likely,” “small chance,” etc.) are imprecise and open to interpretation, thus creating a potential for miscommunication. Kent (1964) recognized this issue and since then efforts have been made to standardize terminology used to communicate uncertainty, by associating vernacular terms with numerical probabilities. For instance, National Intelligence Estimates produced by ODNI include “An Explanation of Estimative Language” section with a chart intended to clarify ambiguity associated with probabilistic terms. Adopting standard terminology across the community may reduce the ambiguity in communication, but coordination within the IC does not guarantee that intelligence consumers will interpret the chosen terms in the same way as they were intended. Although some research has been conducted that examines how intelligence analysts interpret verbal probabilities (e.g., Mandel and Wulf 2010, Wulf 2008), to the best of our knowledge, there is no comparable study of interpretations of verbal probabilities among intelligence consumers. Such a study would be fascinating to conduct, but is not very feasible given the inaccessibility of high-level decision makers for research purposes. A first step that is feasible would be to assign analysts to either consumer or producer roles.

The level of precision with which uncertainty is identified is also a debated issue. For example, Steinberg (2008) argues that although knowing the relative degree of uncertainty is helpful, assigning probabilities (or converting numerical probabilities to designated terms) may be misleading and give a false sense of concreteness to a consumer. While we agree that precise numeric estimates are unnecessary in cases where ordinal rankings are all that are needed to support decision making (e.g., in risk management prioritization exercises), we believe that objections to the use of numeric estimates in intelligence analysis based on the “false sense of precision” argument are also somewhat misguided since numeric probability estimates need not be given in precise terms. Range estimates (e.g., 70% - 90% chance of X happening in the next 6 months) are imprecise, but are nevertheless unambiguous and clear. Indeed, such estimates also communicate an analyst’s level of confidence. Namely, confidence is inversely proportional to the range.

Communication skills are required in many professions. In intelligence analysis, however, communication, especially written communication, is a key activity. In addition to merely transmitting information, written communication shapes an analyst’s thinking process: “Oral briefings are valued and often called for. But ultimately, writing is what the analyst’s work is about – writing based on organizing material, conceptualising, and thinking critically about it” (Hedley 2007, p.216).

3.1.9 Evaluation of quality of intelligence products

Results. Some managers commented on the lack of formalized procedures for evaluating the quality of analytic reports. These managers noted that it does not mean that quality checks are not done at all – managers do check and challenge reports and the underlying analytic processes; however, the quality assessment of intelligence reports is a subjective process, and specific requirements and expectations may vary among managers.

> *No, [there is no standard for evaluating quality of the reports] other than the director’s subjective view of whether that product is a quality product or not. But that’s a very loose standard and different directors will have different views of that.* (Interviewee)

In addition, some IAS managers noted that producing an intelligence assessment involves a great deal of interaction and collaboration between the analyst and his or her manager. Consequently, managers may become involved in the analytic process itself, and, in this case, analytic products become the joint product of the analyst and his or her manager. Some managers observed that manager's direct involvement in shaping the analytic product and process could make it difficult for the manager to evaluate the quality of the report objectively.

> … *it* [the intelligence report] *is ultimately a joint product; it's not just the analyst. The director should have a role in refining it and revising it. It's difficult for the* [manager] *to be completely objective because they are in it as well.* (Interviewee)

The results of our interviews suggest that the degree of managers' involvement in the analytic process varies across intelligence organizations. Managers from CDI mentioned that they may not have as much opportunity to get involved in the analytic process due to short timelines and various pressures that require their attention.

Managers from IAS pointed out that their organization has recently implemented a practice of referencing sources in reports as a step towards ensuring rigour and quality of the products. Analysts are required to clearly separate statements of fact from their judgments. Further, they must reference their sources for all statements of fact and provide justifications for key judgments in the report. According to some managers, this practice will make it easier to trace back to the information on which the analysis is based.

CDI managers we interviewed commented that similar measures have not been implemented in CDI, primarily because the workload and time pressure do not allow for steps that require additional time.

> *Analysis is not procedural at CDI. CDI analysts and their managers do not spend much time on formulaic processes (e.g., no footnotes or references); conclusions are what matter. Reports are vetted, checked, challenged, but not through a formal procedure.* (Interviewee)

Discussion. Because intelligence is a service function for decision makers, assessing quality and value of intelligence products is an important issue for the intelligence community. Moore and Krizan (2003) suggested that "success" of intelligence analysis may be assessed by examining two main criteria – the intelligence process and intelligence product (see also Moore et al. 2005). Assessing the "intelligence product" implies assessing the value of analytic conclusions in meeting consumer needs (i.e., enriching their understanding and knowledge regarding an issue pertinent to their area of concern), as well as the accuracy and calibration of the judgments offered (Mandel 2009a, Rieber 2004). Evaluating the "intelligence process" implies assessing the soundness of methods used to arrive at analytic conclusions, including the train of logic, quality of information, soundness of assumptions, consideration of alternatives, and clarity of communication. Tetlock and Mellers (2009) discussed implications of putting emphasis on either one of these criteria (i.e., product or process) and suggested that a combination of the two criteria may provide a more comprehensive approach to evaluating intelligence outcomes and ensuring analysts' accountability.

Brei (2005) proposed six principles or core values of intelligence: *accuracy* of information used in analysis; *objectivity* in judgments; *usability* of intelligence by the consumers; *relevance* of intelligence to consumer requirements; *readiness* of intelligence to respond to consumer's needs; and *timeliness* of intelligence (i.e., that it is still actionable when delivered). Brei's principles are interdependent and violation of one of them (e.g., accuracy) may affect the others (e.g., relevance). Brei argued that while some of the six criteria do rely on feedback from consumers, other criteria could be evaluated without such feedback.

The practice of source referencing employed by IAS is a first step towards establishing standard procedures in the process of analysis. It necessitates that analysts check the sources of information upon which they rely, making it easier for managers to follow up on the information if needed. This requirement may improve the quality of the analytic process by reducing the amount of time a manager needs to invest in evaluation; it may also provide the manager with some information on the analysts' trains of logic. However, the process by which the information was evaluated, selected, interpreted and combined still remains subjective, undocumented, and at the discretion of the analyst. Consequently, the evaluation of the product and process still relies mostly on the subjective judgments of the managers.

Assessing usability, relevance, timeliness, and impact of an intelligence product relies heavily on feedback from consumers. Some managers commented that it is difficult for them to obtain information on the impact their finished products have on their consumers due to the paucity of feedback. Measuring the impact of analytic products is indeed a difficult problem, and not only because of limited feedback. Because the role of intelligence is to provide a better situational understanding (and not to suggest decisions) to consumers, the impact of intelligence on the resulting consumer's decisions cannot be easily judged and measured (Herman 1996, Treverton 2001). In addition, consumers receive information from various sources (intelligence being only one), which makes it hard to attribute a difference in someone's understanding to a specific source of information (Medina 2009, Treverton 2001).

Herman (1996) and Bruce and George (2008) discussed the problems with measuring the real impact of intelligence assessments: It is difficult to assess the "quality" of information in a report, and it is difficult to estimate the impact of a given intelligence product on a particular action. "Most intelligence effects are on users' frame of mind rather than on identifiable actions. Even where particular intelligence outputs can be correlated with use there is usually no obvious way of measuring effects on outcomes" (Herman 1996, p.299). Also, measuring the effect of information is difficult: "as for its use, no one really knows what difference information makes" (p.300). The difficulty in measuring intelligence success also stems from the fact that resulting changes in policymakers' views or preventative actions inevitably change the state of affairs with which the intelligence was concerned (Betts 2009, Bruce and George 2008). Thus, it makes it difficult to envision the counterfactual "what if" consequences of analysis on the development of events.

Managers and analysts may make efforts to ensure the relevance of their reports at the outset of the assessments by defining and negotiating topics for the reports and timelines for their delivery; however, it does not guarantee that the final products will be timely, relevant, and useful.

Besides meeting consumer needs for information, another important characteristic of intelligence products is the actual accuracy of the judgments provided in the reports, which may be used in evaluating analytic reports. Judgment accuracy is different from Brei's principle of accuracy,

which refers to the information used in analysis. The latter stresses the accuracy of inputs used in analysis, and the former refers to the accuracy of predictions or the output of the analysis process. Although misjudgements are inevitable in intelligence analysis (Brady 1993, Heuer 1999), intelligence products would have been of little use if their assessments were only seldom or randomly accurate.

As in other areas where probability estimates are provided by professionals (Dawson et al. 1993, Murphy and Winkler 1984, Tetlock 2005), the accuracy of predictive intelligence judgments can be examined systematically over large numbers of cases using objective, quantitative measures such as calibration and discrimination analyses (Yaniv et al. 1991). An analyst is said to be well calibrated if the relative frequencies of observed events match the assigned probabilities of predicted events. In other words, for judgments of, say, 0%, 20%, 40%, 60%, 80%, and 100% chances of occurrence, perfect calibration would occur when the relative frequencies in these probability classes were 0%, 20%, 40%, and so on, respectively. Discrimination, on the other hand, measures the extent to which an analyst uses the full range of the probability scale and avoids hedging his or her bets by always predicting the base rate within a judgment class (i.e., the average likelihood of predicted events actually occurring) or a fudge value such as "fifty-fifty" (Fischhoff and Bruine de Bruin 1999). Statistical measures of discrimination are akin to measures of the proportion of variance explained in the criterion. Although any given probabilistic prediction is unfalsifiable, calibration and discrimination measures offer a means of assessing the aggregate performance of an analyst or analytic organization. Aggregate analyses of predictive accuracy also avoid the problems of cherry picking successes (Tetlock 2009) and misconstruing particular intelligence failures as a general failure of the system (Betts 1978). In Canada, Mandel (2009b) conducted such an analysis of the accuracy of approximately 600 predictive judgments made by analysts in one IAS division. He found that analysts' judgments exhibited a high degree of calibration and good discrimination. Indeed, excluding a small number of "fifty-fifty" judgments, about 90% of the predicted events were correctly classified. Correct classification in this case means that events don't occur when the assigned probability of the predicted event is less than .5 (or 5/10 on the relevant 0 – 10 scale used) and events do occur when the assigned probability is greater than .5. Stated differently, in about 90% of the cases examined the probabilistic prediction offered pointed in the right direction. Similar studies have yet to be conducted in other countries or with other intelligence organizations within Canada. Thus, for the time being, the quantitative analysis of judgment accuracy (and quality, more generally) has been very limited.

It is worth noting however, that compared to other areas where probability estimates are provided by professionals (e.g., the medical profession), intelligence judgments have a unique property – an intelligence judgment can lead consumers to implement preventative actions that may alter the likelihood of the predicted event's occurrence or prevent it all together (Betts 2009). In light of this "warning problem," one might expect a greater degree of deviation in analysts' accuracy (Mandel, 2009a).

Calibration of analysts' accuracy can only assess analysts' performance with respect to the events that analysts identified. However, it has no means of incorporating occurrence of relevant events that analysts did not identify or foresee, but which have a significant impact on consumers. An overall measure of intelligence judgment quality also needs to take into account what proportion of the set of all relevant events was identified by intelligence judgments. A comprehensive assessment of intelligence judgment quality may need to incorporate a set of measures that

capture different aspects of analysis quality. For instance, Mandel (2009b) examined calibration and discrimination as a function of the importance of the analytic judgment for intelligence consumers (as judged by an independent senior intelligence analyst). Interestingly, judged importance had a negligible effect on those measures of judgment quality, indicating that it is not simply the case that performance is good for relatively inconsequential judgments.

It is the responsibility of intelligence managers and analysts to ensure the soundness of the analytic process and resulting judgments. Evaluating the quality of intelligence processes is closely related to the state of the current practice of intelligence analysis in the community. Intelligence analysis has been practiced as a craft, mostly relying on the skills, capabilities, and experience of individual analysts. There is a lack of accepted standard analytic procedures and therefore, evaluation of analytic processes is subjective (Johnston 2005, Marrin and Clemente 2006). As some managers pointed out, this subjective evaluation allows for variability in the criteria used by different managers.

In a situation where there are no standard evaluation procedures and it is difficult to obtain feedback from consumers, subjective appraisal by managers is often the only product evaluation that takes place. Some managers commented that the subjectivity of the product evaluation may be furthered by managers' involvement in the development of a product. Managers' contributions to shaping intelligence products make it more difficult for them to remain objective when evaluating it. On one hand, a manager's involvement in the product development process helps to ensure that the product conforms to the manager's quality requirements before the product is disseminated. On the other hand, a certain degree of personal authorship in the product might make it more difficult for the manager to assume a completely objective perspective while evaluating the product's overall quality and impact, especially if other more objective measures are unavailable.

In addition, evaluation of analytic assessments is a time-consuming process that requires significant investment on the part of the manager. Depending on their time constraints, managers may not have time to adequately evaluate each report. Demands on managers' time are determined by the number of reporting analysts, reports' timelines, and production volume. When these demands increase, a manager, naturally, will have less time available for each report. The nature of activities undertaken by an organization in part shapes an organization's structure and control mechanisms. Mintzberg (1979) identified five possible coordinating mechanisms within an organization that shape its structure: mutual adjustment, direct supervision, and standardization of inputs, processes, and outputs. The discussion above suggests that standardization in intelligence analysis at any level – inputs, processes, or outputs – is not feasible and, perhaps, may not be beneficial. Intelligence organizations rely mainly on managers directly supervising analysts and their activities, and on mutual adjustment through informal interaction among analysts working as a team. Mutual adjustment and direct supervision require significant involvement from managers in their subordinates' activities and greatly limit their optimal span of control. In order for these coordinating mechanisms to be exercised effectively, one manager ought to supervise a relatively small unit. As more analysts join an organization, further division may be required to maintain coordination at an optimal level and avoid overloading managers.

3.2 Challenges in intelligence analysis

The nature of analytic activities and the organizational environment place certain demands on analysts. How efficiently one can function under these demanding conditions depends on individual experiences and one's ability to cope in the analytic environment. This section discusses a number of individual and organizational challenges in the analytic process that managers identified.

3.2.1 Challenges stemming from the nature of the task and individual differences

3.2.1.1 Information overload

Results. Most managers noted that one of the challenges for intelligence analysts is that the amount of available information is constantly growing, and analysts must sort through, evaluate, and absorb what is relevant.

> *One challenge for analysts is information overload. A large amount of data needs to be digested and only relevant information extracted from it.* (Interviewee)

The processes of information search and analysis are highly interdependent. Some managers pointed out that analysts have to walk the fine line between collecting too little information (thus making flawed inferences based only on what is available) and collecting additional information at the expense of engaging in thorough analysis.

> *The challenge is to know when to stop searching and to start drawing conclusions given the existing uncertainties.* (Interviewee)

Some managers commented that there are no guidelines for determining how much information is enough, and analysts make this decision intuitively based on their experience. The amount of time available to produce a report constrains and determines the duration of information search.

> [Question: How do you decide that you have enough information and that you can start drawing conclusions?]: *There is no real way to frame this one. I guess it's instinctive. I start writing when I feel confident in my ability to address an issue. Yet, deadlines, more than anything else, usually dictate the writing schedule.* (Interviewee)

In addition, all managers commented that intelligence analysis is characterised by a great deal of uncertainty, and that analysts need to compensate for gaps in available information with their judgments.

Discussion. Rapid development and expansion of communications and information technologies considerably facilitate creation, transmission, and storage of information leading to the constant increase of information available, which impacts intelligence analysts and the process of analysis (Hedley 2007, Johnson 2007, Johnston 2005, Treverton 2001, Woods et al. 2002). However,

individual ability to extract meaning from that information has not increased along with the available quantity of information (Woods et al. 2002). Quantity of data cannot compensate for its quality. On the contrary, some managers commented that often there is a lot of information available on a given issue, but some of it is not credible and a lot of missing pieces remain. When more information is made available, analysts have to sort through more data to find what is relevant and reliable.

"The challenge for intelligence – sorting fact from fiction, or signals from noise – is new only in magnitude. But the change in magnitude is awesome … in some respects, the harder problem for intelligence arises simply from the volume, not evil intent: As 'publishing' gets easier, standards of verification go down. Collecting information is less of a problem, and verifying it is more of one" (Treverton 2001, p.9 - p.10). Analysts' knowledge of the issue at hand helps them to effectively deal with the mass of information (Davis 1992, Woods et al. 2002). However, because requests to intelligence analysts have become more varied, analysts are more often required to work on topics outside their bases of expertise. This exacerbates the problem of information overload, as analysts do not have sufficient background knowledge to help them separate signals from noise (Patterson et al. 2001).

Time constraints make it virtually impossible for analysts to absorb all available information, and there is a trade off between having ample information and providing a timely assessment. The risk associated with stopping the search too soon is that important information might be missed and the resulting analysis and judgments misguided. Prolonging the search for too long, however, might not allow sufficient time for processing and analyzing the information, or the analysis might reach decision makers too late to be useful, especially in the case of warning intelligence (Betts 1978). Prolonging the information search can also be a symptom of decision avoidance, discussed in the next sub-section. In a study by Patterson et al. (2001), experienced analysts who were under time pressure missed some relevant information and had difficulty resolving data conflicts when analysing an unfamiliar topic. However, analysts who, despite the pressure, spent more time searching for information and reading more documents made fewer or no inaccurate statements.

Medina (2009) also points out that information "abundance" has made it more difficult for intelligence analysts to provide value to intelligence customers. Medina indicates that intelligence consumers are generally well informed and, in addition to other sources of information (such as media and personal communications), they often have access to "raw" incoming traffic of intelligence at the same time as the analysts. Having access to "raw" intelligence traffic before they receive analysts' assessments of this information, intelligence consumers inevitably interpret and form their own understanding of the available facts before analysts have a chance to provide their insights. Thus, to provide value, analysts have to "surpass the analytic abilities of their customers" (Medina 2009, p.110) and also, perhaps change any judgments they may have made if they do not concur.

With more information available, analysts may have less confidence that they have sampled all relevant corroborating and contradictory information that is potentially available, and they do not have time to exhaust their sources (Woods et al. 2002). Information overload also taxes analysts' cognitive resources, as they need to search, evaluate and absorb increasing volumes of information. Information overload places higher demands on analysts' memory and representational abilities, which are needed in order to discern or "visualize" patterns in vast

quantities of information. Learning effective search and information management and organization strategies becomes important to this end. We did not discuss in our interviews with managers the efficiency of analysts' information search strategies, but there are some indications in the literature that analysts may be unaware of the range of available information search techniques. For example, Patterson et al. (2001) observed that analysts, whose analytic experience ranged between seven and thirty years, mostly used inefficient "primitive" search strategies. Patterson et al. suggested that focussed training and better design of information systems may increase the effectiveness of analysts' search behaviours. Some managers commented that there is a lack of adequate information systems that help to organize and connect relevant information. According to Woods et al. (2002) " … solving data overload problems requires both new technology and an understanding of how systems of people supported by various artefacts extract meaning from data" (p.34).

With respect to continuous striving for more information in intelligence analysis, Heuer (1999) raises an issue of added value of acquiring additional information, recommending thorough evaluation of the available evidence instead of continuous search for additional data. Heuer suggests that intelligence analysis is analogous to medical diagnosis in that an analyst should generate several plausible explanations given the available evidence and then collect additional information that will be diagnostic in differentiating between the hypotheses in the considered set, much as a physician will attempt to do in reaching a medical diagnosis. Marrin and Clemente (2005) support Heuer's medical diagnosis analogy, and suggest that the analytic profession might stand to benefit from adopting current practices used by the medical profession to maximize the accuracy of diagnoses.

3.2.1.2 Judgment avoidance – fear of being wrong

Results. Most managers commented that analysts are required to make judgments in all of their reports, which is a difficult task for analysts.

> *Some analysts can't make a judgment partly because they don't want to be wrong.* (Interviewee)

> *There is a lot of uncertainty about the conclusion, and it is often hard to make a decision.* (Interviewee)

Some managers attributed the difficulty in making judgments mainly to the uncertainty inherent in analytic activity and the fear of being wrong. According to these managers, decision avoidance is common among intelligence analysts because their decisions often have implications for human lives. Further, variations in individual personality characteristics may contribute to difficulty in making judgments.

> *I've seen this very clearly. Complete avoidance of judgments or caveating* (sic) *a judgment to the point that no matter what happens they will be right.* (Interviewee)

Discussion. Judgment avoidance may be exhibited in either withholding judgment altogether, that is, not providing judgment on an issue at all, or it may also be expressed by providing a judgment but in a vague form that is consistent with several interpretations. As some managers pointed out,

making judgments in intelligence assessments is difficult because situations and their outcomes are uncertain, and there is always a possibility for a judgment to turn out to be mistaken. Judgment avoidance may be due to the desire to escape accountability for a judgment that may be incorrect or an effort to achieve consensus with other analysts or agencies, which tends to make the judgments even more vague.

Intelligence is a service that is intended to provide useful information to intelligence consumers. Some practitioners suggested that vague judgments are not helpful to consumers, and instead of striving for consistency among analysts and agencies, it may be more beneficial to highlight alternative views or potential outcomes (McLaughlin 2008, Steinberg 2008).

3.2.1.3 Reluctance to accept alternative perspectives

Results. Another difficult aspect of intelligence analysis according to some managers is for analysts to have their judgments challenged by their managers or colleagues.

> *It is difficult [for analysts] to accept other ideas and thoughts and allow people to challenge their conclusions.* (Interviewee)

Nevertheless, managers have to challenge their analysts as part of their role to ensure quality control of the products. For managers, challenging their analysts requires maintaining a balance between questioning their conclusions to ensure rigour and quality in the analytic products and trusting in their analysts' expertise.

Discussion. Analysts' resistance to having their assessments challenged could be explained by a number of different psychological causes, some of which are personality-driven (e.g., high Need for Closure; Webster and Kruglanski 1994) and some that are common to the process of challenge itself. At the time the analyst's work is challenged, the analyst has presumably invested considerable time and effort into the work to settle on certain conclusions. At this point, it might be difficult to consider alternatives because most people have an inherent desire to maintain intrapersonal consistency (Cialdini et al. 1995). Analysts might be inclined to resist challenges to their conclusions because inconsistency (i.e., changing one's conclusions) feels unnatural or uncomfortable. There are conceivably a number of self-enhancement biases that could also cause analysts to resist the challenge function. Generally speaking, self-enhancing beliefs can be quite adaptive. For example, being confident in one's ability can breed persistence, which can in turn lead to success (Taylor 1989). Positive illusions (i.e., positive self-views that may be unfounded) are also associated with benefits such as adaptive coping and improved intellectual functioning (Taylor and Brown 1988). Taylor and Brown identified three types of positive illusions that people tend to exhibit: unrealistically positive views of their abilities, exaggerated control over events, and excessive optimism about their future. The first type especially could stifle the challenge process. When a manager challenges the analyst's work, an analyst may feel that the manager is questioning his or her judgment and reasoning abilities. It may be difficult for analysts to consider that they might be wrong when they hold such positive illusions about their analytical abilities. Further, people tend to be overconfident in their factual judgments – especially for difficult problems – which can lead them to dismiss opposing views (Fischhoff 1991). The challenge process is difficult not only for the analysts but also for their managers. Managers often do not have as much background information on the issue or as much time to devote to

it as analysts do, and so it is difficult to generate pertinent questions that will truly serve the challenge function.

3.2.1.4 Poor logic and a lack of rigour in analysis

Results. Some managers expressed their concern over the quality of analytic thinking that goes into some intelligence assessments and the overall analytic rigour.

> *Sometimes analysts draw false conclusions whereby the evidence is precise but the inference unfounded. Basic, informal logic is very important.* (Interviewee)

> *The rigour in challenging hypotheses, and search for information that disproves hypotheses is not there … they [analysts] are given that much [a lot of] information to read and are told to produce. They don't have time to go through a rigour.* (Interviewee)

Discussion. No doubt, the quality of logic and analytic rigour are constrained by the individual abilities of an analyst and his or her knowledge and experience. Some of these individual characteristics include analytic reasoning skills and knowledge of state-of-the-art analytic techniques and their appropriate application. Some authors suggested that analysts require creative imagination to envision alternative hypotheses and explanations (Bruce 2008, Pritchard and Goodman 2009). The degree of rigour that an analyst employs depends on his or her understanding of what constitutes good analytic practice, which may vary considerably due to the community's reliance on an "intuitive approach" to analysis and the lack of accepted analytic standards. In addition, as our interviewees pointed out, overwhelming situational demands (i.e., short timelines coupled with massive amounts of information) may preclude even the best equipped analyst from ensuring analytic rigour and following best practices. As a result, the lack of analytic rigour and poor logic in analysis may be the product of various causes such as, individual characteristics, accepted analytic standards within the community, and situational demands. Addressing this problem, therefore, requires analyzing and identifying the relative contribution of these causes to the problem of the lack of rigour in a particular case, and it will most likely require a variety of intervention strategies.

3.2.1.5 Cognitive biases

Results. Most managers pointed out that analysts are susceptible to cognitive biases, which affect thinking, logic, and ultimately the resulting judgments, and that overcoming these cognitive obstacles is not easy.

> *Intelligence analysis is a business of forecasting, predicting the future, and the analysts tend to focus on the status quo – assume the future will look like the present … . Analysts are prisoners of their own experiences. There are problems of confirmation bias and mirror imaging, and it is very hard to avoid them.* (Interviewee)

> *There is a whole aspect of trying to understand a different culture and [to] think from their perspective on what is likely to happen next. That is a huge challenge, because it is completely and utterly foreign.* (Interviewee)

One manager also commented on the negative relationship between the level of an analyst's expertise and his or her ability to recognise the changing trends in a situation (i.e., to evade confirmation bias).

> *Some longer-term analysts have developed a way of looking at things and may not give sufficient weight to new things that challenge the way they have been dealing with an issue in the past. Sometimes, newer analysts can make better distinctions about things that have changed.* (Interviewee)

Discussion. The role of cognitive biases and mind-sets in intelligence analysis, and especially in intelligence failures, is one of the key topics that has attracted the community's attention. It has been generally accepted that mind-sets and biases are unavoidable, as they are inherent to human information processing (Butterfield 1993, Davis 1992, Heuer 1999). Davis further noted that:

> " ... no amount of forewarning about the confirmation bias (belief preservation), the rationality bias (mirror imaging), and other powerful but perilous shortcuts for processing inconclusive evidence that flow from the hardwiring of the brain can prevent even veteran analysts from succumbing to analytic errors. One observer linked cognitive biases to optical illusions; even when an image is so labelled, the observer still sees the illusion" (p.159).

In the literature, cognitive biases have also been divided into those that are inherent to human information processing, such as confirmation bias, and those that arise from one's knowledge and experience with an issue, such as one's mental model (mind-set) or worldview (Davis 2008). Both types of bias direct and affect an analyst's information processing and are seen as unavoidable. In addition, according to Davis, the mindsets that are developed over the course of one's experience with a topic are "indispensable," as without them, the task of analysis would be impossible: "an open mind is as dysfunctional as an empty mind" (Davis 2008, p.160).

The difficulty associated with understanding a different culture's perspective and projecting one's own cultural values and beliefs onto others has been referred to as mirror-imaging, "everybody-thinks-like-us mindset," coherence bias, rationality bias, and projection bias (Davis 2008, Heuer 1999). Intelligence analysts often have to understand and predict behaviour and motives of individuals and groups from countries or regions that have different backgrounds, lifestyles, cultures, values, and goals than those of Western society where analysts reside. Making accurate predictions and decisions about a foreign group or culture requires understanding values and motivations of that culture or group, and understanding the situation from that culture's perspective. Some managers commented that, to gain this understanding, analysts tend to rely on knowledge collected during area trips to the region and their direct experiences and immersion in the culture. Nevertheless, it is difficult not to project the basis for one's own reasoning and motivations onto the other party. Attribution of the other party's reasoning and motivation based on one's own perspective (whether correct or erroneous) may become a form of mind-set for understanding the opponent. Misjudgements based on such erroneous attributions may be seen in

many intelligence failures such as the failure to recognise Soviet motivation and willingness to install nuclear missiles in Cuba preceding the Cuban Missile Crisis in 1962, the failure to anticipate the surprise attack that started the Yom Kippur War in 1973, and the failure of the Iraqi government to foresee the US intervention in the Iraq-Kuwait conflict leading to the 1991 Gulf War (Brady 1993, Davis 2008, Jervis 2009). Furthermore, it may become even more difficult for analysts to overcome cultural barriers if a certain mindset or perspective is institutionally reinforced.

One of the approaches to dealing with the issue of mind-sets and biases proposed in the literature has been focused on raising analysts' and managers' awareness of potential biases (Heuer 1999). Although increased awareness may not prevent seeing an illusion as an illusion (using Davis' analogy), it may still increase awareness of the possibility of such an illusion and lead to a more careful examination of one's conclusions. Another approach to help alleviate biases that has been discussed in the literature focuses on the development and application of tools and techniques (Davis 2008, Heuer 1999). An example of a technique developed to counter confirmation bias is ACH developed by Heuer (1999). Although there is evidence to suggest that ACH does reduce confirmation bias in novice analysts, its effects on expert analysts has not been demonstrated using scientific research methods (Cheikes et al. 2004). This further reinforces the necessity of subjecting developed tools and techniques to careful and systematic evaluation in order to assess their effectiveness in countering certain cognitive biases.

Managers' observations of the negative relationship between an analyst's expertise on an issue and his or her ability to recognise "unlikely" developments was also discussed by Davis (2008). Davis suggested that analysts' expertise in a given domain may be very helpful in foreseeing the normal course of events but may make it more difficult to recognise "unlikely" developments. The question is what are the underlying psychological processes of the analyst, and the task-specific properties of intelligence analysis, that lead to this effect. The difference between an expert and novice analyst is that the expert undoubtedly has formed a highly developed understanding of the situation – a "mind-set," using Davis' terminology – which is probably more intricate than that of the novice. The expert is "deeper into the woods," so to speak. In addition, the "accuracy" of the expert's model has been frequently confirmed (i.e., by events that have conformed to the model) by virtue of the fact that they have been working on the issue for a longer period of time than the novice. Naturally, the expert examines (consciously or not) incoming information in light of the presently entertained theory; the novice, who may still be developing his or her model, may have a more "neutral" approach to incoming information.

Observations from intelligence experts raise an interesting issue regarding the relationship between expertise and susceptibility to the confirmation bias, which has not been studied extensively in the field of cognitive psychology. There are conflicting views in the scientific literature with respect to the impact of expertise on performance in novel situations, and the underlying cognitive processes involved. For instance, in the domain of expertise research, it is generally theorised that acquired expertise in a domain leads to greater sensitivity to details in that specific domain (Gobet and Simon 1996) and increases cognitive flexibility, which is expected to attenuate confirmation biases (Feltovitch et al. 1984, Krems and Zierer 1994, Smith and Kida 1991). Conversely, research in the domain of creativity and skill acquisition has suggested that knowledge of certain methods of approaching a given problem and prior experience with the domain may actually lead to the opposite effect and increase rigidity in experts that hinders them in finding creative or novel solutions. This cognitive rigidity is

presupposed to be the result of set (Einstellung) effect or automatization created through experience (Bilalic et al. 2008, Luchins 1942, Sternberg 1996). The increased cognitive rigidity does not directly imply the presence of confirmation bias, yet such a relationship is plausible.

It is worth noting, however, that while there are several, competing theoretical views on the subject of cognitive flexibility or rigidity of expertise, the empirical evidence supporting or refuting these views is rather scarce and inconclusive (Bilalic et al. 2008). In addition, the domain of intelligence analysis may possess unique properties, not transferable to other domains. Directed examination of the nature of expertise in the intelligence analysis field is a promising starting point in gaining a better understanding of its impact on experts' interpretation and judgments of dynamic environments.

The analytic challenges discussed above most likely do not have ready-made solutions. However, further investigation and scientific research may improve our understanding of the underlying social and psychological processes involved.

3.2.2 Challenges due to the organizational environment

This sub-section outlines characteristics of the organizational environment that contribute to challenges in intelligence production.

3.2.2.1 Inadequate staffing

Results. One of the most commonly mentioned challenges on an organizational level by CDI managers was not having a sufficient number of personnel to perform all of the activities in the organization's mandate. This leads to analysts in CDI performing a wide variety of tasks.

> *Our people have to work on different things depending on demand, because we are short on people.* (Interviewee)

The issue of an inadequate number of human resources was not raised as much by the IAS managers that we interviewed, and so seems to be more pertinent to the military environment.

Discussion. The effects of having fewer personnel than is optimal for performing the required tasks are not unequivocal and may entail positive as well as negative consequences for both the organization and its staff. According to staffing sufficiency theory (Barker 1960, 1968, Vecchio and Sussmann 1981, Wicker 1979a), moderate levels of understaffing (i.e., where there is (moderately) insufficient or barely sufficient personnel to carry out the essential tasks) have been associated with increased employee motivation and involvement, increased task diversity, skill utilization, increased individual effort, and, in some instances, improved individual and group productivity (Ganster and Dwyer 1995, Perkins 1982, Vecchio and Sussmann 1981). Thus, under certain conditions, understaffing may have positive individual and organizational effects. The relationship between the level of understaffing and task perceptions is curvilinear, meaning that extreme levels of understaffing will result in perceived work overload and stress, which undermines any positive effect of understaffing (Vecchio and Sussmann 1981). In addition, positive effects of moderate understaffing may diminish with continuous exposure to

increased workload situations and result in negative consequences (Wicker and Kirmeyer 1976, Wicker 1979b).

The inadequate staffing issue in CDI seems to be more of a chronic nature and, theoretically, may lead to the other problems listed below:

- Time pressure and work overload for current personnel, because they have to complete multiple tasks. Time pressure not only compromises the reasoning process itself but, due to time constraints, also limits the tools and techniques that analysts are able to utilize in their analysis (as application of each tool or technique requires additional time).
- Analysts may be unable to develop deep expertise in a given area or topic, as they are constantly switched to address currently pressing issues. This may also result in a lack of continuity as different individuals might work on a given topic at different times depending on their availability.
- The emphasis shifts toward addressing current issues, and strategic organizational development concerns are more likely to fall by the wayside; formal organizational processes are less likely to be followed and workarounds are more likely to appear.
- Constant work overload eventually results in employee stress, decreased motivation, and contributes to personnel turnover.

It may be beneficial to explore optimal staffing arrangements that may minimize negative impact on employees. Addressing this issue, however, requires wider organizational analysis and intervention, the feasibility of which depends on available resources, other constraints, and existing competing priorities.

3.2.2.2 Turnover

Results. Another frequently mentioned organizational challenge was the issue of turnover. This issue was especially pertinent to CDI because a considerable proportion of CDI's analysts are regular military personnel that are on a three-year posting cycle. One interviewee mentioned that about one third of analytic staff at CDI change every year due to the regular military posting cycle. At IAS, turnover is less of an issue because analysts are civilian indeterminate public servants that are not affected by posting cycles. IAS has been able to retain their analysts for longer periods, on average.

> *When an analyst walks out the door – assets are portable – everything is between the ears. You walk out and it's gone. It's really a bad business model … you need a system that will groom and facilitate long term periods of analytic study on areas without having to deal with this back and forth of people coming and going. The loss is really too high; it's too much of an investment and you get nothing out of it when they walk out the door*. (Interviewee)

Discussion. Similar to understaffing, turnover has been shown to have complex impact on both individuals and organizational performance. Negative impacts of turnover include:

- general reduction in productivity (Argote et al. 1995, Bluedorn 1982);

- loss of expertise in a subject area, organizational practices, and loss of organizational memory (Carley 1992);
- disruption of organizational processes (Price 1977, 1989, Staw 1980);
- disruption of social relationships within an organization that may be imperative for task performance (Dess and Jason 2001, Leana and Buren 1999); and
- demoralization among remaining employees who are required to take on additional responsibilities to cover for personnel who have left the organization (Mowday et al. 1982).

On the other hand, turnover has been credited with increasing organizational innovation by bringing in new individuals (Dalton and Todor 1979, Price 1989) and improving the individual-organization fit. The latter is mainly applicable to volunteer turnover (when individuals choose to leave or join an organization out of their free will) and it may not be applicable to the military context.

Given that constant turnover is inevitable and predictable in the military environment, it may be possible to plan for and implement various measures to minimize its negative impacts. Minimizing the impact of turnover on organizational practices requires systematic knowledge preservation practices and ensuring effective knowledge transfer from departing analysts to new arrivals. However, from our interviews, there seemed to be no systematic practices in place at the organizations surveyed. Although there may be several causes for this situation, the issue of inadequate personnel plays a significant role. Implementation of systematic knowledge preservation and transfer activities would be beyond immediate operational needs, and thus would put additional strain on already limited organizational resources. Additional resources (i.e., organizational slack) may be necessary to implement any new initiatives while maintaining the same level of output.

3.2.2.3 Time pressure

Results. Time pressure was also identified as an integral property of the military intelligence environment.

> *There is constant time pressure.* (Interviewee)
>
> *The issue of time pressure and how that affects judgment and decision making is very relevant.* (Interviewee)

Time pressure creates a situation in which various tasks that analysts carry out as part of their assessments are forced into competition. As a result, there is less time to apply analytic techniques, to document the analytical process, and to reference sources. The issue of time pressure was raised more by managers from CDI than managers from IAS.

Discussion. Conducting intelligence analysis under constant time pressure may have an impact on the process of analysis and its outcome as well. Time pressure affects information search and evaluation practices as well as analysts' ability to solicit feedback from other experts in the field. Limited time to complete an assessment restricts the amount of time available for thorough analysis and evaluation of alternative hypotheses. Time pressure forces analysts to think quickly,

not allowing them to pay as much attention to the thinking process itself (thus making analysts potentially more susceptible to inherent pitfalls of human judgment).

The effects of time pressure on the intelligence assessment process is two-fold: On the one hand, it has a direct effect on the analysis process by limiting the time available for information search, analysis and report preparation; and, on the other hand, it affects thinking and decision making processes (Maule and Edland 1997). There is an opinion within the intelligence community that time pressure may contribute to and exacerbate effects of cognitive biases (Bruce and Bennett 2008, Johnston 2005, Treverton 2008). Research in cognitive psychology has shown that time pressure:

- affects performance on tasks with high working memory demand (Beilock and Carr 2005);
- alters risk-taking behaviour and reduces attention to secondary information (Dror and Busemeyer 1999, Huber and Kunz 2007);
- reduces the amount of information considered in decision making (Huber and Kunz 2007, Rieskamp and Hoffrage 2008);
- affects decision making and problem solving strategy (Rieskamp and Hoffrage 2008, Zakay and Wooler 1984); and
- reduces confidence in the decision (Smith et al. 1982).

A research program designed specifically to investigate the effects of time pressure on both basic cognitive processes involved in intelligence analysis and impact on expert performance would help to clarify the role of time pressure on the intelligence analysis processes.

3.2.2.4 Lack of feedback on the final product

Results. Managers from IAS commented that their analysts cannot always receive feedback on the impact of their assessments on the decision making process.

> *Getting feedback on the final product is one of the most difficult problems of this whole thing – to know whether we are fully meeting needs of our clients.* (Interviewee)

This issue was mostly raised by the IAS managers, as there seems to be more of a disconnection between analysts and decision makers than at CDI.

Discussion. The main purpose of intelligence assessments is to provide critical information to decision makers – policy makers or commanding officers – to aid their understanding of a situation and allow them to make more informed decisions (Herman 1996, Treverton 2001). The relationship between the producers and consumers of intelligence assessments is critical in ensuring the utility of these assessments. Ideally, the input from intelligence consumers into the intelligence production process is required at minimum at two stages: during the formulation of intelligence requirements and providing feedback after the assessment is completed. The role of clear, specific, and timely requirements is important for directing analysts' efforts onto the right path. Similarly, intelligence consumers' feedback on the utility of the intelligence product after it

is completed is essential for analysts to better understand consumers' needs and to adjust their (future) assessments accordingly.

As we discussed in Sub-section **3.1.3**, an intelligence production unit or agency, as any other social organization, can be conceptualized as a system with inputs (e.g., information, feedback), transformation (e.g., the process of analysis), and outputs (e.g., completed intelligence assessments). In systems theory, feedback, especially negative feedback, is one of the essential informational inputs that allows a system to adjust its processes in order to successfully function in its environment (Katz and Kahn 1978). Lack of adequate feedback to analysts on their products threatens the relevance of the intelligence production system.

The relationship between producers and consumers of intelligence is complex and based on mutual interdependency. However, the initial trend in the US (and, perhaps, Canadian) community to separate intelligence from decision makers in an effort to preserve analytic integrity and avoid "politicization" of intelligence has threatened the relevance of intelligence products to consumers. This disconnection is reinforced by the structural organization of intelligence consumer and producer roles that does not allow for frequent interaction and collaboration. In light of recent reviews of intelligence practice, many writers on intelligence recognize the necessity of "bridging the gap" between intelligence producers and consumers in an effort to make intelligence more relevant (Gardiner 2009, Steinberg 2008, Treverton 2001, 2008).

Another issue worth noting in the producer-consumer relationship that may contribute to the difficulty in obtaining feedback on final products is that the interdependency between intelligence consumers and producers is not symmetrical (Davis 2006). Given that intelligence is only one of the sources of information for consumers (Davis 2006, Medina 2009), intelligence, being a support function, is more dependent on consumers than consumers are dependent on intelligence. This asymmetric interdependence, no doubt, contributes to communication challenges experienced between producers and consumers. Bringing intelligence producers and consumers closer together may require certain organizational restructuring and task adjustments. This relationship is extremely important for ensuring relevance of intelligence products, and warrants more focused attention in the Canadian community. For an elaborate analysis of consumer-producer relationship in the Canadian context, see Cox (2010).

3.2.2.5 Breakdowns in inter-departmental and inter-organizational information sharing

Results. Some managers pointed out that there are a lot of breakdowns in interdepartmental and inter-organizational information sharing, which prevent analysts from having access to potentially valuable information.

> *I think if we actually did a forensic scrub of how we move information, and who we post it to and share it with, I'm sure there are a lot of breakdowns in the organization and that we don't pass key things, they don't pass key things. Each pillar or subgroup has its own practices for how they share and that is something I wouldn't know anything about.* (Interviewee)

Nevertheless, analysts compensate, to some extent, for breakdowns in information flow by maintaining their informal personal networks of peers, to whom they can turn whenever needed.

> *A great deal of intelligence sharing is still a personal relationship. Even if it's not the right way to go, they can get you in touch with the right person because they know their organization.* (Interviewee)

Discussion. Information is by far the most important input in the intelligence analysis process. Analysts draw on information from several sources, some of which rely on sharing within their own organization and sharing among different organizations. Herman (1996) argued that production of effective intelligence requires inter-agency cooperation. The main barriers to free information flow that some managers commented on could be attributed to existing inconsistent information classification practices in different organizations, the "need to know" attitude, which results in reluctance to share information, and breakdowns in interdepartmental coordination and integration. The US intelligence community is faced with similar problems (Treverton and Gabbard 2008) and, perhaps, even to a greater extent than the Canadian community due to the vast number of players in the US arena. Breakdowns and barriers in information sharing increase uncertainty for intelligence analysts and can contribute to intelligence failures. For instance, Treverton (2001) attributed the accidental bombing of China's embassy in Belgrade in 1999 to intelligence failure resulting from breakdowns in communication between imagery analysts and local collectors. Also, breakdowns in inter-organizational information sharing and coordination were identified as one of the main causes of the 9/11 attack intelligence failure in the US community (9/11 Commission 2004, Hulnick 2008).

Some managers pointed out that information sharing in the intelligence community relies to a large extent on informal social networks. The recently released Intelligence Community Performance Standards document in the US recognizes the importance of informal networks – the ability to develop and sustain such networks as one of the six performance elements for professional intelligence analysts (ODNI 2009).

As already discussed in Sub-section **3.1.6.1**, "Information sources", there are advantages and disadvantages associated with relying on informal networks for information sharing. Informal networks greatly depend on personal relationships, and it may take a long time for a new analyst to establish a network of peers. When these relationships are disrupted for various reasons (for example, as a result of changing positions), information sharing is disrupted as well.

The US community has launched an effort under the ODNI initiative to improve inter-organizational coordination and collaboration. Under this initiative, the Analyst Resource Catalog has been created, which includes names and areas of expertise of over 17,000 analysts from across the community allowing specialists to find one another. In addition, a central depository for all intelligence assessments from across the community, the National Intelligence Library, has been created with the goal of fostering information sharing across agencies (Tucker 2008). Given that these practices prove to be beneficial to the US community, the implementation of similar approaches might be considered within the Canadian community as well.

It emerged from our interviews that an extensive study of information needs, flows, and breakdowns within Canadian IC may help to improve information flow in some organizations, as well as within the community more broadly.

3.3 Essential skills

Results. All managers interviewed agreed that successful performance of analytic tasks requires a certain degree of inherent individual ability. Our interviewees pointed out that identifying a set of essential skills and capabilities required for intelligence analysis is an important issue for the community. Managers shared their ideas regarding what these essential skills may be. We grouped the identified characteristics into four general categories – analytic ability, environmental suitability, knowledge, and personal characteristics. *Table 1* presents an aggregated list, which includes a grouped summary of all skills that were mentioned. Some of the skills in this list were mentioned by only one manager while other skills were mentioned by several. Most of the items are listed in their original wording and are arranged in alphabetical order within the categories.

Table 1: List of essential skills for intelligence analysts identified by managers

	Skill/Ability	Description
1	**ANALYTIC SKILLS**	
1.1	Abductive reasoning skills	Abductive reasoning refers to inferring the best possible explanation for the given evidence. Abductive reasoning, according to some managers, creates new knowledge, whereas inductive and deductive reasoning do not.
1.2	Ability to deal with large amounts of information	Refers to the ability to extract and summarise information from a large quantity of available data. This ability is perceived by managers to be an inherent talent, which is hard to teach.
1.3	Awareness of one's assumptions	Analysts predominantly have to deal with incomplete information, which requires making assumptions with respect to what is missing in order to produce judgments. A good analyst is aware of the assumptions upon which his or her judgments rely, which allows for the assessment of the quality of his or her assumptions.
1.4	Critical thinking	Although managers did not elaborate on what they meant by critical thinking, this term generally refers to a process of purposeful thinking about a subject that employs logic, examination of the evidence and assumptions, and evaluation of the thinking process itself.

1.5	Writing and communication skills	No matter how important the intelligence assessment conclusions might be, they will be of limited value if the analyst is unable to communicate them in an effective manner. Because the majority of intelligence assessments are communicated in written reports, analysts need to be good writers.

2 ENVIRONMENTAL SUITABILITY

2.1	Ability to deal with uncertainty	Uncertainty is an inherent characteristic of intelligence analysis and analysts need to be able to work under conditions of chronic uncertainty and effectively deal with its consequences. This includes: • the ability to make up for missing information with judgments and conscious assumptions; • to have the drive to get to the bottom of the problem despite various obstacles; • to overcome the fear of being wrong and the discomfort with uncertainty of the decision outcome and make judgments
2.2	Ability to work under significant stress levels	Stress here refers to emotional and mental stress. Factors that contribute to stress for intelligence analysts include time pressure, number of tasks, data overload, consequences of assessments, deception, etc.
2.3	Be emotionally solid	This ability was mentioned in relation to military analysts who deal with operations. Because the consequences of intelligence reports lead to the "application of violence on the battlefield," (and thus have tremendous impact on other people's lives), analysts need to be able to emotionally manage the consequences of their actions and remain at the top of their performance.
2.4	Teamwork	Analysts need to be able to work effectively in a team environment.
2.5	Time sensitivity	Intelligence is time sensitive and analysts need to be able to accept deadlines and deliver final products on time.

3 KNOWLEDGE

3.1	Breadth of experience	Knowledge of various areas. This quality is more pertinent to CDI analysts, who are moved around the organization.
3.2	Deep regional expertise	This quality is more pertinent to IAS, where analysts are required to specialize in a given region. Deep knowledge and firsthand experience with that region is extremely beneficial for interpreting events as well as incoming information from the region.
3.3	Environmental awareness	Analysts need to have background knowledge in their area and on the issues with which they are dealing; they need to know what is important and what to pay attention to in the vast amount of incoming information.
3.4	Knowledge of the collection process	Analysts need to be knowledgeable about various collection methods and their strengths and shortcomings. This knowledge impacts analysts' abilities to properly evaluate the reliability and credibility of information, and is especially pertinent to information collected through HUMINT sources.

4 CHARACTERISTICS

4.1	Accurate memory	Analysts have to read through large quantities of documents and reports, and keep the details of what they have read in their memory in order to be able to find patterns and connections among various documents. Analysts need to rely on their memory especially given the lack of efficient information management systems.
4.2	Flexibility	Flexibility here refers to the ability to adapt to changing environmental (organizational) demands.
4.3	Integrity and moral courage	Analysts need to have enough courage to "speak truth to power". This may be particularly challenging in the military context.
4.4	Self-starter	Analysts need to be self-motivated and constantly working on their area.
4.5	Thirst for knowledge	Analysts need to be inquisitive, and have a passion for constant learning and reading.
4.6	Thoroughness	This refers to the need to be detail-oriented and careful, especially in evaluating and interpreting evidence.

Discussion. Identifying core competencies required for intelligence analysis is an important issue for the community and is essential for selection and performance evaluation of intelligence analysts. Both the US and Canadian intelligence communities have started examining this issue in more detail. For example, DRDC's Director General Military Personnel Research and Analysis (DGMPRA) conducted an Intelligence Officer job analysis and identified five competencies required by Intelligence Officers – general cognitive ability, personality factors, leadership, information technology, and communication skills (Smith 2009). In a follow on effort, Girard (2010) found a significant overlap between core competencies of Intelligence Officer and Intelligence Operator occupations. The competencies identified by managers in our interviews considerably overlap with those identified by Smith (2009) and Girard (2010). For example, "general cognitive ability" identified by Smith (2009) overlaps with "analytic skills" and "knowledge" categories in *Table 1*. "Personality factors" from the study by Smith (2009) overlaps with "environmental suitability" and "characteristics" categories in *Table 1*.

The US intelligence community has undertaken an effort to standardize performance requirements for intelligence analysts. ODNI has recently released a document outlining a set of uniform performance standards for the entire US intelligence community (ODNI 2009). Specified performance dimensions overlap somewhat with those listed by managers in our interviews, and include: accountability for results, communication, critical thinking, engagement and collaboration, personal leadership and integrity, and technical expertise. In order to be applicable to the entire intelligence community, the list is inevitably general, but it captures the essential competencies required for intelligence analysis.

The list compiled from managers' comments, naturally, is not a comprehensive list of analysts' skills; however, it provides an insight into the skills and capabilities managers view as important. An extensive effort was undertaken in the US at the National Security Agency (NSA) to identify core competencies required of intelligence analysts (see Moore and Krizan 2003, Moore 2005, Moore et al. 2005). Moore and Krizan grouped the identified competencies for intelligence analysis into four categories – abilities, skills, knowledge, and characteristics (see *Table 2*). Krizan (1999) further differentiated among four types of intelligence – descriptive, explanatory, interpretive, and estimative intelligence – and Moore (2005) suggested that a different set of capabilities may be required for each type of intelligence. In our interviews, we did not make a distinction among different types of analysis and specific skills required for each.

Moore and Krizan's list of core competencies contains a set of fairly general and basic skills that may overlap with essential capabilities of other professions. Conducting an analysis of cross-functional skills and generalized work activities could allow other jobs and job families that require similar capabilities to intelligence analysis to be identified. Moreover, identifying job families related to intelligence analysis could provide an opportunity to leverage training and assessment practices for certain skills shared with related occupations.

There is significant overlap between the list of capabilities identified by the managers who were interviewed (*Table 1*) and the list compiled by Moore and Krizan (*Table 2*). It is worth noting that, although the list that we compiled based on managers' comments does not include all of the items from Moore and Krizan's list, our list also includes capabilities not identified in the NSA study. Capabilities that were mentioned by participants in our study that were not described by Moore and Krizan relate to analysts' abilities to deal with environmental demands, such as working under stress, delivering to deadlines, demonstrating emotional stability, dealing with

uncertainty, making up for missing information, making judgments under uncertainty, being able to stand by their judgments, and possessing accurate memory.

Some of the managers pointed out that not just anybody could be trained to be an analyst because intelligence analysis requires a certain set of inherent abilities. The skills and capabilities mentioned by managers reflect this idea; some of the items represent inherent abilities that cannot easily be learned or improved (e.g., thirst for knowledge and ability to cope with uncertainty) while other items in the list might be more responsive to appropriate training methods (e.g., regional expertise and technical knowledge). The managers' notion that intelligence analysis requires some inherent ability was also reflected in Moore and Krizan's results – items grouped under characteristics and abilities represent, in the authors' opinion, inherent qualities, while items under knowledge and skills are viewed as those that may be acquired.

Table 2: Moore and Krizan's list of core competencies for intelligence analysis

Type	Items	Type	Items
Abilities	Communicating (includes aural, graphic, visual, oral)	**Knowledge**	Target knowledge
	Teaming and Collaborating (includes influencing, leading, following, synergizing)		Intelligence community
	Thinking (includes information ordering, pattern recognition, reasoning–induction, deduction, and abduction)		Government plans and policy
			Customers
			Analytic resources
Characteristics	Insatiably curious	**Skills**	Critical thinking
	Self-motivated		Literacy
	Fascinated by puzzles		Computer literacy
	Exhibits "AHA" thinking[3]		Expression
	Observes voraciously		Foreign language proficiency
	Reads voraciously		Research
	Fruitfully obsessed		Information gathering and manipulation
	Takes variable perspectives		Project/process management
	Makes creative connections		

[3] Note: "AHA" thinking refers to the gaining of an insightful understanding of an issue, i.e., experiencing a "eureka" moment

	Playful	
	Has sense of humour	
	Has sense of wonder	
	Concentrates intensely	
	Questions convention	

To identify core capabilities for intelligence analysis, it may be beneficial to examine these capabilities in light of individual differences from research in personality and social psychology. For example, Smith (2009) identified three factors of the Five Factor Model of personality – conscientiousness, agreeableness, and openness to experience – as important in Intelligence Officer training and performance. Girard (2010) recommended including in the selection process the Trait Self-Descriptive Personality Inventory Revisited (TSD-PI) measure for evaluating the relevant personality factors. The TSD-PI can capture some, but not all of the personality characteristics that may be critical for intelligence analysis. For instance, one of the essential activities in intelligence analysis that was identified is generation of alternatives and their careful evaluation (Davis 2006, Heuer 1999, Jervis 2009, Moore 2007, Steinberg 2008). The ability to effectively deal with uncertainty and to generate and thoroughly evaluate alternative explanations may be contingent upon individual differences such as those specifically measured by the Need for Cognition (NFC) scale (Cacioppo and Petty 1982) and the Need for Cognitive Closure (NFCC) scale (Kruglanski and Webster 1996), to name but two examples.

The NFC scale is a stable individual difference evaluation that reflects the extent to which an individual seeks out and enjoys effortful cognitive activities. People who score higher in the NFC scale would be more inclined to envision different alternatives and would be more comfortable contemplating them under uncertainty. The NFCC scale is another stable individual difference measure that reflects one's need for reaching closure or arriving at a conclusion on an issue and hanging onto that conclusion, which provides a comfort of certainty. Therefore, people who score higher in the NFCC scale would not tolerate uncertainty well, tend to "jump to conclusions," be more reluctant to change their minds, and be less inclined to give all alternatives due consideration.

Given the nature of these individual differences and the distinct requirements of intelligence analysis, we would expect more successful analysts to score higher than average in the NFC scale and lower in the NFCC scale. McLellan and Mandel (2010b) have begun to assess Canadian intelligence analyst trainees on these two individual differences measures, along with a measures of accuracy and coherence based on the Decision Making Competence index (de Bruin et al. 2007). The aim of their field research is to test whether or not those individual differences predict coherence and accuracy, and to establish baseline levels for the community, as compared to the general population. To the best of our knowledge, there have been no efforts to date to correlate these individual differences with performance measures with a sample of intelligence personnel. If proven to be reliable predictors of analysts' decision making performance, then the NFC and NFCC scales may be usefully employed in the analyst selection process. The NFC and NFCC

scales may complement the TSD-PI measure recommended by Girard (2010) for the selection process of Intelligence Officers and Intelligence Operators in the Canadian Forces.

The proposition that stable individual differences predict performance on intelligence analysis activities presents a unique opportunity for the community to improve its selection processes. Assessment measures could be developed to test candidates for analytic positions on the requisite characteristics. On the other hand, acquired capabilities could be used for performance evaluation. However, more research is required to reliably identify correlates of analytic performance before such measures may be implemented.

3.4 Selection process

Results. The selection process for intelligence analysts is an important issue for the community and some managers commented that there is room for improvement in the current selection practices.

Civilian analysts in both organizations are selected based on their academic backgrounds and performance on selection tests. In terms of their background, successful candidates are expected to have a Master's degree, usually in political science, area studies, or history. A candidate's field of study is not as restricted in CDI, where candidates with degrees in other disciplines might also be considered. Some CDI managers commented that analysts in CDI tend to be generalists and are usually moved among different areas of analysis; therefore, it may not be as important for new analysts to have deep expertise in a certain region, and, rather, it is the breadth of experience that is commonly valued. Some managers from IAS, on the contrary, commented that their organization is often looking for specialists rather than generalists, and that it tends to put emphasis on hiring people with deep knowledge of a given area or a region. Analysts' knowledge and experience with a given region usually plays an important role in the selection process at IAS.

In addition to satisfying background requirements, candidates for positions at both organizations undergo an interview and a writing skills test, which help managers to assess their analytic and writing abilities. Some managers pointed out that after hiring an intelligence analyst, it takes an average of six months to one year to be able to truly assess their capabilities and fit for the job, and, at that point, it is "either great or too late" (Interviewee). Civilian managers in CDI are not involved in the selection of military intelligence analysts that work in CDI; those analysts are appointed to their positions through a secondment process. The majority of military analysts in CDI are coming from the Intelligence Branch, but some military analysts who come from other branches of the CF might lack training or background in intelligence analysis.

There are several factors that may impede the selection process, four of which are discussed below. First, managers do not agree on the precise skills and capabilities required of analysts to perform their roles[4].

> *… right now there is not a lot of it [selection based on skills]. In terms of being selected as an analyst it is just a chair that we put someone in, so there is the expectation that anybody can be an analyst.* (Interviewee)

[4] There have been recent community-wide efforts to identify the essential skills for intelligence professionals. See, for example, ODNI (2009).

This issue not only hampers the selection process, but also the development of a comprehensive training program for analysts.

> *I think, it will be helpful for us as a community if we had a really original research project that was looking at what makes a good analyst, developing and mapping all those skills, understanding them and being able to teach them, and then working into how to make a great intelligence analyst as part of the training program.* (Interviewee)

Second, to test candidates on the identified skills in the selection process, accurate and effective assessment tools are needed.

> *There is [a test to gauge capability], but it's not very good. We've included interview questions to get at people's ability to deal with large quantities of information and how they make judgments. But ultimately they are completely inadequate. People may have interesting things to say, but whether that's actually how their mind works when they are sitting down here looking at a problem may or may not be the case. We are trying to come up with questions that will help us identify people's abilities in these areas … . Maybe a formal test would be good, but we are not in the position to come up with that.* (Interviewee)

Third, some managers also commented that not all skills and characteristics needed in successful intelligence analysts could be tested. They emphasised the individual-environment fit, where different organizational environments place unique demands on individuals, and it is important for individuals to be able to cope with these demands.

> *The kind of environment we are in requires a level of flexibility – there is a fair bit of stress, a fair bit of teamwork; there are a lot of outside demands … . I think there are a lot of those kinds of factors that you can't test for.* (Interviewee)

Finally, the requirements of the public service personnel selection process impose certain constraints on the analyst selection process. Although most of the managers commented on deficiencies of the current selection practices in their organizations, they still pointed out that the process is somewhat effective and allows them to select capable individuals with reasonable success. However, it is unknown whether or not the process selects those best-fitted for the job and whether or not other, more capable individuals were screened out by the current selection processes.

Discussion. Several factors constrain the analyst selection process. First, the ability to identify the essential competencies required from potential recruits is one of the constraints, and is directly related to our discussion in the section "Essential Skills" above. As Moore (2005) suggested, core competencies required of analysts may differ from one organization to another, and even for different positions within the same organization. The requisite competencies for a position are determined by the types of activities an analyst is expected to carry out, and the demands of the organization.

Second, there is a need for tools to effectively assess the identified competencies. Based on the interviewees' comments, there seem to be a need for both – identification of competencies and

tools for their assessment. A third constraint according to the managers is imposed by uniform organizational policies, which govern the selection process and limit its flexibility.

A fourth and final constraint in the selection process is the lack of professional training and education in the intelligence community. There are no special training programs to prepare individuals entering the intelligence analysis profession, and training occurs only after analysts have been hired into their positions. A professional education program in intelligence analysis prior to entering the job market, supplemented with a university co-operative program, may be beneficial to both students and intelligence organizations. Co-operative education programs allow students to supplement classroom study with relevant work experience in varied contexts to better prepare them for the challenges of their future careers. On the other hand, intelligence organizations may be able to better evaluate potential candidates by observing students in a work context. The feasibility and desirability of implementing this training program depends on the state of professionalization of the intelligence community and on the demand for such professionals, especially given the relatively small size of the Canadian community.

The intelligence analysis selection process may benefit from further research to identify essential capabilities for intelligence analysis as well as to develop evaluation tools to measure these capabilities. In addition, as suggested above, an alternative or a supplementary approach to candidate evaluation may be achieved through internship and co-operative education programs that will bring prospective candidates into the organization's work environment for a prolonged period of time, allowing managers to observe and evaluate prospective candidates in a realistic work environment.

3.4.1 Manager selection: Analyst-to-manager progression

Results. CDI managers commented that intelligence analysis is seen as a junior activity in the military community. Military analysts do not stay in their analytic positions for prolonged periods, partially due to the rotational nature of military posting cycles and partially due to the promotion process. Successful military analysts are expected to move out of analytic roles and move up to capability management. This creates a somewhat paradoxical situation, in which good analysts do not stay in their positions long because they are promoted. The resulting rotation of personnel through analytic roles prevents continuity and expertise retention in the roles.

Personnel turnover is not as much of an issue in the civilian sector, where analysts have an opportunity to stay in analytic roles throughout their career. As in the military, however, the best analysts move out from analytic roles to management positions, where some struggle to make time to engage in analytic work while others abandon analysis altogether. Some managers commented that the skill set required for intelligence analysis is quite different from that needed to be an effective manager; good analysts do not necessarily make good managers.

Discussion. Identification of managerial candidates and succession management are important issues for the intelligence community. Intelligence managers not only play a significant role in shaping the analytical process (Moore et al. 2005), they also significantly influence the professional development of intelligence analysts reporting to them. As we discuss in the following section, development of intelligence analysts in the Canadian community greatly relies on a mentoring model in which an analyst's immediate manager provides mentorship to the analyst. Thus, it is crucial to the development of junior analysts that their managers have

knowledge and experience in intelligence analysis. As some managers have pointed out, however, excelling at analysis is not sufficient to be a successful manager. Because the skill sets required to be a successful analyst differ from those of managers, it is important to identify the distinct capabilities required to be an effective manager in the context of intelligence analysis. Unfortunately, we did not discuss in detail the promotion and succession process and practices during our interviews with the managers. There is a dearth of literature on this topic as it relates to the intelligence community, an exception being a report by Hatfield (2008) that deals with issues of succession management in the top three tiers of the US intelligence community.

3.5 Training

3.5.1 Current practices

Results. Some managers commented that new intelligence analysts get most of their analytic training after they join the organization through mentoring from their managers and introductory courses organized by individual organizations, as no specific training in intelligence analysis is available in Canada prior to joining one of the intelligence organizations.

> *All the intelligence analysis training the analysts get on the job.* (Interviewee)
>
> *For the first 6 months on the job, analysts typically learn through a mentorship relationship and interaction with their directors.* (Interviewee)

Some managers also pointed out that the quality of the mentoring relationship is more important for improving analysis than various analytic tools and procedures.

Different organizations have their own internal training courses tailored to suit their specific needs. An example of such training is IAS's internal six-day introductory course in intelligence analysis, which is offered approximately every two years, depending on the number of new analysts.

We did not discuss military intelligence training in detail, but managers at CDI pointed out that there is a much more structured training program for the military intelligence professionals that, among other aspects of the intelligence trade, also include components on intelligence analysis. Civilian analysts normally do not have access to the analytic training provided to military analysts.

Discussion. Analytic training, at present, occurs mainly in two ways: through mentoring and through training courses. There are, no doubt, advantages to mentoring, such as individual attention in addressing the specific needs of each analyst at a comfortable pace. However, as there is no agreed upon approach to analysis, it is likely that different managers emphasise different methods and approaches to analysis, and managers may have varying requirements and standards. An individual manager's expertise in analysis and his or her mentoring skills are important to the effectiveness of mentoring. Moreover, the mentoring approach to training is very time consuming for managers, which may be problematic, especially if the number of supervised analysts increases.

In addition to receiving mentoring, analysts may be able to partake in various training modules that may be offered through their own organizations, through the PCO or other Canadian departments, or through programs offered by allied countries. These modules address particular topics that are largely independent of each other. Whether or not analysts are able to take advantage of these training courses greatly depends on the needs, current pressures, and resources of their organizations.

Some agencies organize and deliver their own in-house training courses for analysts. Organizing and maintaining such internal training programs is very time- and resource-consuming for organizations and significantly limits what a single organization may be able to do. The establishment of centralized community-wide training in intelligence analysis may be more cost effective, ensure uniformity of training across the community, and promote the development of community-wide analytic standards. Reviewing US IC reform, Hulnick (2008) emphasised the importance of centralized basic training for intelligence professionals. In Hulnick's opinion, centralized training would reduce costs and provide an important opportunity for analysts to build relationships and professional networks with peers from other agencies that would promote information sharing and cross-agency collaboration.

Treverton and Gabbard (2008) observed that a community-wide course in intelligence analysis is lacking and, like analysts in Canada, analysts in the US receive most of their training on the job.

In the Canadian IC, the Intelligence Assessment Learning Program (IALP) was established to oversee, develop and coordinate training efforts in the community. The PCO, through the IALP, has developed a ten-day community-wide introductory intelligence analysis course. The course covers foundations of intelligence analysis, and has been attended by analysts from various departments since 2006 (Pyrik 2007). There are also seminars and shorter modules offered through the IALP to address specific issues. The introductory IALP course is not mandatory for analysts and not all agencies enrol their analysts in this course. Some managers echoed the opinion of Hulnick (2008) that one of the benefits of attending a community-wide course is meeting people from other departments and expanding the analysts' professional network.

At present, training for intelligence analysts is rather haphazard, and analyst development lacks a unifying structure that would ensure a well rounded, systematic, extensive and comprehensive education in intelligence analysis practices. Establishing such a unifying training structure for analysts would require first defining the discipline of intelligence analysis and the core competencies that have begun to emerge in the community literature (Bruce and George 2008, Johnston 2005, Marrin and Clemente 2006). A professional development curriculum would rely on identified core competencies for intelligence analysis and would be informed by training experiences of Canada's allies (Goodman and Omand 2008, Marrin 2003). The development of a community-wide training program could foster the development of professional performance standards and personnel management practices, which in turn may advance the professionalization of intelligence analysis. However, the need and feasibility of such a program in the Canadian context would need to be determined by the community, and would depend on the resources available.

Intelligence *training* is also distinct from what might be called intelligence *education*. Whereas training usually focuses on teaching trainees a certain set of techniques or specific skills, education often focuses on developing a critical mindset – one that values intellectual curiosity,

creativity, and other liberal values. In the intelligence domain, the question of education hinges to a large extent on whether one views intelligence analysis more as a profession or as a trade. Given the difficulties that the IC has in handling training, one might expect the education of future analysts to fall under the remit of universities. Although a number of Canadian universities offer various courses on intelligence subjects, the international affairs program at Carleton University, Ottawa, Ontario, is, perhaps, the only civilian university program in Canada that incorporates intelligence studies within its international studies program (Rudner 2009). Rudner (2009) outlined a number of reasons for the lack of intelligence programs in higher education. On the one hand, secrecy associated with intelligence activities and their clandestine nature may have led to reluctance on the part of universities and academics to engage in teaching and research in the area of intelligence. On the other hand, inadequate public awareness may have resulted in the lack of government funding to support academic research in the intelligence domain that would have not only contributed to the development of the area, but also prepared qualified faculty. A number of Canadian government organizations employ civilian intelligence analysts (among them are CDI, PCO, Canadian Security Intelligence Services, Royal Canadian Mounted Police, Canada Border Services Agency, Transport Canada, Environment Canada, Citizenship and Immigration Canada), and specialized programs and individual courses in Intelligence Studies go a long way towards developing students for a career as intelligence analysts. Rudner (2009) emphasised the importance of developing such programs and establishing centers of Intelligence Studies that would be proportionate to the national interest in intelligence affairs. Moreover, civilian university or college training in intelligence *analysis* that could fully prepare potential analysts to work in an intelligence agency is even more limited. This is unsurprising because intelligence agency work requires a certain level of classification that a university environment would be unable to provide, and, hence, most of the training in analytic tradecraft analysts receive occurs *after* joining an agency, through working closely with managers, as noted earlier.

3.5.2 Training challenges

3.5.2.1 Consensus regarding core competencies for intelligence analysis

Results. One of the biggest challenges in training intelligence analysts is the lack of available systematic training programs that focus on analysis. Some managers commented that the work that the PCO has done in developing community-wide intelligence training is a great step forward, but much is left to be done. One of the difficulties in developing such a program, according to the managers, is reaching an agreement within the community on "exactly what it takes to make a great intelligence analyst," that is, what are the core competencies for intelligence analysis.

> *Training is an important issue that the intelligence community has tried to deal with for some time. It is not easy because the requirements are somewhat different in each department.* (Interviewee)

> *When you speak of core competencies, different agencies are going to understand different definitions for core competencies ... when we first looked at the training program we wanted to look at what were the core competencies of analysts so that we could tailor the training program. That was like pulling teeth! … getting*

the community to submit to us their competencies was incredibly tedious. (Interviewee)

Discussion. A community-wide training program for intelligence analysts would need to hone knowledge and skills that are valuable and pertinent to various agencies within the community. Therefore, agreement within the community on what such a program should emphasize is important to ensure acceptance of the program. As different intelligence departments are faced with a myriad of issues and pressures, they have different conceptions of core competencies for intelligence analysts. However, the reason for difficulty in reaching a consensus may be two-fold: it is difficult for departments to identify core competencies pertinent to their organization, and there exist considerable inter-departmental differences in the sets of competencies identified. The former issue may require internal focussed efforts in analysing a department's requirements[5], while the latter may require inter-departmental negotiation and a broader view of the tradecraft of intelligence analysis.

Notwithstanding inter-organizational disagreements on what constitutes analytic competencies, consensus may be possible. Krizan (1999) differentiated among four levels of intelligence analysis – descriptive, explanatory, interpretive, and estimative. Moore (2005), using Krizan's typology of analysis and the set of core competencies of Moore and Krizan (2003) for intelligence analysis, argued that each type of analysis may require a different set of abilities, skills, and knowledge. Furthermore, Moore's analysis revealed that despite the differences among the four types of analysis, there remains a common set of abilities, skills, and knowledge required for all: information gathering and manipulation skills, critical reasoning, computer literacy, oral and written communication skills, research skills, knowledge of the intelligence community, and knowledge of government plans and policies[6].

The extent to which Moore and Krizan's set of core competencies for intelligence analysis is pertinent to the Canadian community remains to be determined, as well as the extent to which Krizan's typology of analytic tasks reflect those faced by Canadian agencies. However, Moore's analysis is encouraging as it suggests that despite differences among organizations, it may be possible to identify a common set of core competencies required of all intelligence analysts. Hulnick (2008), emphasising the importance of community-wide basic training for intelligence analysts, noted that inter-departmental differences are inevitable and that the need for focused agency-specific training would remain. This may be the case for the Canadian intelligence community as well.

3.5.2.2 Assessing training effectiveness

Results. Another challenge in training intelligence analysts is assessing overall effectiveness of training in the required competencies.

[5] Such as the DGMPRA's efforts in conducting the Intelligence Officer job analysis and identifying core competencies for Intelligence Officer and Intelligence Operator occupations (Girard 2010, Smith 2009).
[6] For more information, see Moore (2005).

> *Clear measures to evaluate effectiveness of the training (i.e., improvements in cognitive ability and thinking skills) are also needed. However, assessing analytical products is a highly subjective process.* (Interviewee)

Discussion. Several dimensions on which a training program could be evaluated have been identified in the training literature: trainees' reactions to training, actual learning, changes in the workplace behaviour resulting from the transfer of training (i.e., the application of learned principles to the practical setting), improvement in performance or organizational results (Kirkpatrick 1967, 1979), and return on investment (ROI) (Phillips 1996). The last two criteria (i.e., organizational results and ROI) are perhaps the most significant factors in determining the rationale for, and effectiveness of, training from an organizational perspective. An effective training program ought not only to ensure that trainees acquire and apply new knowledge and skills, it should also ensure that the application of training leads to measurable performance improvement (i.e., the organizational results). Investment of organizational resources into a training program, even if it is only analysts' time away from their regular duties, could only be justified if the benefits resulting from participation or administration of the training program outweigh the costs.

Identifying a set of essential capabilities for intelligence analysts that correlates with their performance may be instrumental to the development and evaluation of training programs. Changes in analysts' competencies due to training could be assessed directly through, for example, administration of a standardized test of the target capability before and after the training. However, measuring the extent to which improvements in the target capability transfer to behavioural changes in the workplace or have an impact on analyst's performance is not a straightforward task. It has been recognized in the training literature that measuring organizational results emerging from training or its costs and benefits is considerably more difficult than measuring trainees' reactions to training or their learning (Blanchard et al. 2000). The difficulty of evaluating organizational results of training in the intelligence analysis context is also amplified by the subjective nature of product and performance evaluation prevailing in the community. In the initial stages, evaluation of analytic training may have to rely on objective measures of learning and managers' and analysts' own subjective evaluations of the training impact.

Intelligence organizations require training programs that improve analysts' task-related capabilities and allow them to be more effective in their jobs. In other words, the ultimate goal of analytic training programs is to enable analysts to become better analysts. Determining the success of a training program is tightly intertwined with the identification of core competencies, measures of analytic performance, and quality of analytic products. That is, one's evaluation of the effectiveness of a training program depends on how one defines effective analysis. Along with the development of a structured intelligence analysis training program, measures need to be developed and agreed upon to assess whether or not the training program achieves its goals.

3.5.2.3 Transfer of training: the role of the favourable workplace environment

Results. Some managers recognized that training, however effective it may be in the short term, may still be ineffective in changing analysts' behaviour if the trained principles are not reinforced on the job.

> *My problem is, once someone has finished the course and goes back to their regular division, unless others are taking a similar approach, a lot of it falls by the wayside.* (Interviewee)

Discussion. Training success depends on a variety of factors. First, performance requirements are identified that are to be attained by the training. Second, the capability that will result in the identified performance requirements is identified. Third, the training program is designed to ensure improvement in the identified capability. Fourth, trainees need to be able and motivated to learn and later transfer the new knowledge to the workplace. Finally, a favourable environment needs to be created to ensure training transfer and sustainable application. It has been proposed in the training literature that training transfer is affected by a system of influences including trainees' characteristics, training design, and work environment (Baldwin and Ford 1988, Holton et al. 2000). Each of these three factors is crucial to ensuring training effectiveness, but it is the latter issue, the work environment, that is discussed presently.

Intelligence analysis is conducted in a particular organizational context with specific situational demands and constraints placed on analysts. In addition, each manager has his or her own requirements and standards for analytic products, which analysts have to satisfy. A training program on analytic tradecraft aims to change the way an analyst conducts various aspects of intelligence production, or, in other words, the aim of training is to change analysts' behaviour in a way that improves performance. Success and effectiveness of a training program depend on whether or not the training produces long lasting changes in behaviour and stability of the learned principles, techniques, and skills over time. However, a training program that results in learning essential job capabilities is not sufficient for ensuring that trainees use what they have learned in the training in their day-to-day jobs. One of the essential components in ensuring long lasting change in behaviour, in addition to an effective training program and willing and able trainees, is creating environmental conditions that provide an opportunity to utilize learned principles and reinforce their application, thus creating an appropriate behavioural setting (Barker 1968). The work environment has been shown to have a significant impact on whether or not trainees use the newly acquired capability in the workplace (Mathieu et al. 1992, Mathieu et al. 1993, Tracey et al. 1995). Some managers realized that if the environment does not encourage application of new skills, then these skills have a greater chance of not being utilized in practice.

For a training program to be effective, it is not sufficient to design a comprehensive curriculum and to have all analysts participate in the program. The situational demands and constraints that are placed on analysts must also be adjusted to ensure that analysts have the opportunity to incorporate the learned principles into their analytic practice. This includes a need for managers to acknowledge the importance of the principles that were taught, and to temporarily adjust their requirements from analysts. Individuals are more likely to relapse to their old way of doing things when they are put under pressure (Zakay and Wooler 1984). Thus, a temporarily reduced workload for analysts may allow them to internalize the new approaches and make them a part of

their practice. Workload reduction may be particularly difficult to implement due to limited resources and pressing timelines.

3.6 Analytic Tools

Results. During the interviews different managers mentioned a variety of structured analytic tools that analysts may potentially use in their work. Some of these include: externalization, mapping, devil's advocate, red cell analysis, decision trees, link analysis, cluster analysis, lists, and ACH. Managers pointed out that analysts are aware and familiar with (at least some of the) tools. However, managers from both organizations commented that analytic tools are not being used on a regular basis, and some managers pointed out that there is resistance to the application of tools within the community. This resistance was attributed to the fact that application of analytic tools might conflict with the currently dominant intuitive approach to analysis.

> *There is a hesitancy to use those kinds of things [structured analytic tools] because essentially the approach to analysis across the community is the intuitive approach … . So any kind of tool is seen with a little bit of suspicion. Some tools are too complex and can take too much time. There are some very simple tools that should be used more frequently like just making lists and things like that … . I don't even think those are used often either ... . There is resistance because there is no magic tool that you can use to get the right answer.* (Interviewee)

Some managers also noted that application of analytic techniques requires additional time investment on the part of analysts. In addition, expertise in training and support for some of the tools and techniques is not available within the Canadian IC.

> *All of them [structured analytic tools] I'm sure have value, but they also take up a certain amount of time, and there is a certain amount of experience required to make them fully effective, and we don't have that experience here in Canada.* (Interviewee)

Other barriers to the application of analytic tools are specific organizational constraints such as short timelines for turning around an assessment and a limited number of available analysts.

> *We teach a lot of tools… The only downside with those tools is that they are most effectively used when you have the resources necessary to give the time required to let someone do that. None of those tools can be used effectively in a compressed period of time … . There is a portfolio of analytic tradecraft tools that analysts are aware of but in practice, given the time constraints, often the reality is that they don't have the time to learn and use them.* (Interviewee)

Discussion. Recent reviews of the intelligence community (e.g., 9/11 Commission 2004, Butler et al. 2004) called for changes and reorganization of intelligence activities. The recent trend in the US IC has been on emphasising the development and application of various analytic tools and techniques that are purported to help manage information overload and to reduce the impact of cognitive biases in analysis. As a result, over the years, various analytic tools and techniques have been adapted to, or developed for, intelligence analysis with the aim to improve human performance on analytic tasks. Some of these tools are described in the literature and training

manuals, and are supported by software packages available for intelligence analysts to use in their assessments (CIA 2005, 2009, DIA 2008, Heuer 2008, Heuer and Pherson 2010).

Some managers that we interviewed acknowledged that the current trend in the study of analytic tradecraft is in the development of new tools *"that are designed to mimic the human reasoning process."* They warned against this and stressed instead the importance of *"reflection on the theoretical basis and limitations of intelligence analysis."* Moore (2007) pointed out that "analysts and analysts alone create intelligence. Although technological marvels assist analysts by cataloguing and presenting data, information and evidence in new ways, they do not do analysis" (p.1). In the opinion of the managers interviewed, tools need to be simple – they should help analysts manage information, externalize the argumentation process, and to facilitate discussion with other analysts, while minimizing the time and cognitive effort required by the analyst to focus on learning how to use the tool in the first place and on how to implement it in each instance of application.

Many of the analytic tools that have been developed and applied, however, have not been systematically evaluated. Although each makes intuitive sense, few studies have actually been conducted to determine whether or not their application leads to the expected type of improvement in judgment. In fact, the literature on analytic technique evaluation is sparse and fragmented (Johnston 2005). Exceptions include work by Folker (2000), Cheikes et al. (2004) and Pirolli (2006) that evaluated ACH as developed by Heuer (1999).

If intelligence analysis undergoes professionalization, it will potentially bring about the development and formalization of best practices and standards (Fisher and Johnston 2008). However, adoption of certain tools and techniques as process standards in the intelligence community first requires their systematic evaluation, which has not yet been done, or, at least, it is not evident in the literature. A certain degree of reluctance from the community in adopting these techniques may be due to the lack of empirical support for their effectiveness. An additional obstacle to the adoption of tools in the community is the lack of resources available for training, implementation, and support of these tools. The plethora of available tools and uncertainty regarding their validity makes investing scarce resources into developing expertise in these tools hard to justify.

Systematic evaluation of analytic tools is fundamental for advancing intelligence analysis as a profession. If done carefully using behavioural science research methods, it ought to yield a superior understanding of the benefits and drawbacks of various tools to support analysis.

3.7 Managers' roles and challenges

During our interviews, some managers also commented on their own roles and the challenges they face. We did not, however, spend much time discussing these issues because our primary concern was on understanding issues related to intelligence analysts.

3.7.1 Manager's role

Results. Managers listed a number of responsibilities that they have, including:

- Generating the production outlook for their group; this includes defining the scope and framing the questions for analytic products.
- Establishing and maintaining an interface with clients, that is, the consumers of intelligence products. This is especially important for defining priorities for assessments and seeking feedback on final products.
- Actively participating in the intelligence community through, for example, chairing an IEG.
- Ensuring production and timely delivery of analytic products of satisfactory quality.
- Ensuring analytic rigour through monitoring analytic processes and challenging analysts in their assumptions, process, and judgments. As mentioned above in Section **3.2**, the challenge function can be difficult for both analysts and their managers. It requires deep knowledge of analytic processes, solid area knowledge, and a great deal of tact from managers.
- Mentoring and developing (new) intelligence analysts.
- Evaluating the quality of analytic products and analysts' performance.
- Being involved in the analysts' promotion process.
- Fulfilling financial management duties and managing budgets.
- Scheduling and allocating resources.
- Providing opportunities for professional development for their analysts.
- Being good listeners in attending to analysts' concerns.
- Shielding their group from various external pressures as much as possible to allow them to concentrate on doing analysis.

Discussion. Managers are an essential part of analysts' environments, and they are involved in structuring, monitoring, and evaluating the analytic process. In other words, managers shape the environment in which intelligence production occurs. Indeed, in Moore and Krizan's words "management has a role to play in making the analysis process successful" (p.211, 2005). As can be seen from the above list, intelligence managers perform a combination of planning, directing or motivating, organizing, liaising, and controlling functions, not unlike managers in other sectors of the public service and industry. Communication with subordinates, superiors, and external parties constitutes a large part of managers' activities. In addition to these tasks, intelligence managers provide individual-based training and mentoring of new analysts. Some managers actively participate in the inter-organizational, community-wide training of analysts and community efforts directed towards professionalization of intelligence analysis.

As we discussed in Sub-section **3.1.9**, the intelligence organizations examined in the current study rely largely on the coordination of intelligence activities through direct supervision (Mintzberg 1979), which requires close personal contact between managers and analysts. The requirements of this coordination mechanism limit the number of analysts any one manager can effectively

supervise (i.e., manager's span of control). Most of the managers that we interviewed, despite their keen interest in analysis, are not able to continue to perform intelligence assessments themselves due to multiple demands on their time. However, in order to monitor and evaluate the quality of analytic products and processes, managers need to be abreast of analytic best practices, current events, and developments in areas being analysed. Managers also need to be aware of potential analytic pitfalls and take steps to minimize their impact on intelligence processes and products.

3.7.2 Managerial challenges

3.7.2.1 Performance evaluation

Managers face a number of challenges related to the evaluation of analytic products and analysts' performance. One of the difficulties in this regard is associated with the absence of clear and consistent feedback from intelligence consumers, which frustrates assessments of the impact of analytic products and whether they fulfil consumers' needs. This issue was discussed in Sub-section **3.2.2**, and in the present section, we focus on other challenges related to performance evaluation that managers identified:

- challenging analysts,
- maintaining objectivity in evaluating a product in which the manager has been closely involved, and
- inconsistency in performance evaluation requirements across managers.

We briefly discuss these issues in the following subsections.

3.7.2.1.1 Challenging analysts

Results. One difficulty in performance evaluation that some managers identified is associated with challenging analysts on their assumptions and thinking processes. These managers indicated that it is their responsibility to question analyst's judgments and analytic process in order to ensure the rigour and overall quality of the product. As we noted earlier, it is psychologically difficult for analysts to objectively evaluate diverging perspectives on the issue without being defensive. In addition to dealing with analysts' defensiveness in this process, managers usually have less information on the issue than their analyst and can only spend a limited amount of time thinking about and researching the topic. This contributes to the uncertainty that managers may experience during the challenging process, making it more difficult.

> *Challenging analysts was very difficult, especially on issues that you are not familiar with. You feel that the questions you are asking are really benign questions ... . There are "difficult" analysts who won't budge from their judgments. With them, you really have a hard time being convinced that what they are arguing is the right conclusion. If you don't have all of the background information and you are not convinced, there is a fine line between being unsure with what they are bringing to you and trusting that they are the experts. You have to have the ability to be forceful, stay on top of the issues so that you know*

> *how and where to challenge your analysts. At the same time, you have to trust your analysts. [There is a] Fine line between being too hands-on and completely letting go.* (Interviewee)

Some managers indicated that the two requirements for effectively challenging analysts are comprehensive knowledge of the subject area and a good grasp of the analytic process. Some managers also pointed out the lack of training for managers on how to challenge analysts and suggested that it may be helpful to develop a standard "challenging mechanism" that could be used regardless of the topic or a manager's familiarity with it.

Discussion. Intelligence managers cannot rely on standard mechanisms for performance and product evaluation; each report requires unique attention. In order to be able to challenge analysts' assumptions and thought processes, a manager needs to have a certain level of knowledge about the topic that is analyzed. The fact that managers usually supervise a group of analysts who deal with various (though related) issues increases the demand on the manager, who needs to remain informed on a variety of topics.

To effectively challenge their analysts, managers also need to be competent analysts themselves, to be aware of the potential pitfalls in judgment, and to be knowledgeable about information sources. These requirements make it more appealing to select intelligence managers from the limited pool of competent analysts, which may limit succession opportunities available for intelligence organizations. In addition to background knowledge and analytic skill and experience, the challenging process requires appropriate social skills. As some managers indicated, trust between a manager and members of his or her analytic team plays an important role in the product evaluation process. Also, the manager's skillful approach to challenging analysts' thinking and assumptions may affect the degree of confrontation between them. As some managers pointed out, there had been no training geared towards managers to prepare them for these challenges. However, since our interviews, the IALP has designed and begun to offer a training course for Canadian intelligence managers.

3.7.2.1.2 Inconsistency in performance evaluation requirements

Results. Some managers also commented on the lack of consistency in requirements for product quality across various departments and organizations.

> *My view is that the quality of papers across the [organization] does vary quite considerably. It varies by analyst and also by [section] … there is no qualitative check or standard, and I think there needs to be [one]*. (Interviewee)

IAS managers commented that in an attempt to standardize the evaluation process, the IAS has implemented quantitative requirements for their analysts, according to which analysts are required to produce a certain number of reports each year, as determined by their experience and the position held. Interviewed managers from CDI did not foresee the implementation of similar performance standards in their organization.

Discussion. There is a lack of consensual guidelines to evaluate the quality of analytic assessments. Thus, the evaluation process in intelligence analysis is largely subjective (Johnston 2005, Marrin and Clemente 2006). Different managers, depending on their own philosophy,

experience, background and pressures, may have differing notions and approaches to evaluating analytic products and analysts' performance. IAS's initiative in establishing quantitative standards for their analysts is a move towards more objective performance evaluation, as it provides means to measure performance based on outcomes. Herman (1996) argued that seeking quantitative approaches to evaluating intelligence and its impact should be part of modern intelligence culture. Since the quality of analytic reports cannot be easily quantified, measurement focuses instead on the number of reports an analyst is expected to produce per annum. Some managers stressed, however, that the papers must be of of sufficient quality. The burden is on managers to ensure the appropriate level of quality and complexity in each report, and that analysts are not just "pumping up their numbers", as one interviewee phrased it. Interviewed managers from IAS welcomed the new quantitative standards because they provide an objective performance evaluation criterion across departments.

Although we did not ask about analysts' attitudes toward this initiative, the increased pressure on analysts to produce a certain number of reports may lead them to focus on quantity of output at the expense of quality. Such a shift in emphasis is known as goal displacement resulting from performance measurement and reward systems. In his classic article "On the folly of rewarding A, while hoping for B", Kerr (1995) provides numerous examples of the goal displacement phenomenon in various organizational settings. The potential goal displacement among analysts, in turn, would increase the burden on managers, who are left to resist this displacement and to ensure the satisfactory quality of reports. In addition, ensuring the quality of reports will become more challenging for a manager as the number of reporting analysts increases.

3.7.2.2 Other challenges

Results. In addition to difficulties associated with evaluating the performance of analysts and the quality of outcomes, different managers commented on a number of other challenges, which included:

- Dealing with underperformers: Some managers pointed out that they have inadequate procedures to deal with underperforming analysts. They would rather tolerate an underperforming analyst than get involved in a time consuming and ineffective formal sanctioning process.
- Learning on the job: Some managers pointed out that there had been no specialized training for managers in the intelligence domain, and they had to learn on the job how to deal with specific issues that arise. It was pointed out that some managers rely on their former superiors' patterns of behaviour that they observed when they were analysts themselves.
- Span of control: As the number of reporting analysts increases, it becomes more challenging for managers to monitor the analysis process, to adequately challenge their analysts, and to ensure the quality of reports.
- Distributing limited budget resources for professional development opportunities for analysts is not easy, as budgets frequently seem to allow for less than what is ideally desired.
- Transitioning into a managerial role is difficult, not only due to a lack of management training, but also because it is difficult to let go of doing analysis. Managers' new

responsibilities do not allow them to continue practicing analysis as much as they would like.

- Some managers also commented that they sometimes have to deal with the personal problems of their analysts, which can be quite challenging at times.

Discussion. Some of the difficulties that managers confront are caused by organizational issues such as human resource practices, which regulates procedures for dealing with underperformers, and organizational structure, which determines a manager's span of control and budget allocation. Dealing with these concerns requires addressing wider organizational issues. Yet some other challenges may be mitigated through specially designed training for intelligence managers and support groups, in which managers could share their concerns with other managers, learn from each other's experiences, share ideas, and provide coaching to each other. Implementation of such coaching circles for the director-level management personnel in industry has had positive results.

3.8 The Canadian intelligence community in general

Results. Some of the managers that we interviewed pointed out that there has not been a tradition of intelligence analysis in Canada and that intelligence as a profession is not well defined in the Canadian community. Recently, there have been organized efforts towards standardization and professionalization of the Canadian IC through such bodies as the Intelligence Assessment Coordination Committee (IACC), IALP, and Canadian Association of Professional Intelligence Analysts (CAPIA), whose mandate is "to make analysis a discipline instead of just a practice" (interviewee). Some managers also pointed out that organizing a community-wide introductory intelligence analysis course is a great step toward analysis professionalization, but much more needs to be done.

As some of our interviewees noted, Canada's IC is significantly smaller than the intelligence communities of its allies (e.g., the US and the United Kingdom (UK)). Having a smaller size, the Canadian community is still faced with a multitude of issues that result in some agencies being understaffed, ultimately putting greater demand on individual analysts. Some managers commented that a community's size has an impact on its methodological traditions and that various analytic tools and techniques are not widely applied in the Canadian community. According to some managers, analytic tools require a time investment to master and their application adds to the time required to complete an assessment. Because of the constant pressure to produce, analysts cannot afford to spend extra time to learn and apply new analytic tools and techniques. As a result, the Canadian community cannot cultivate the expertise in these methodological areas that is necessary for developing community training programs and providing support to analysts in their application of the techniques.

The relatively small size of the Canadian community also limits the number of available experts in a given area, resulting in prospective intelligence consumers shaping analytic assessments (e.g., through the IEGs). Some managers that we interviewed see this involvement as inevitable due to the size of the Canadian community, and beneficial in bringing analysts and consumers closer together.

Discussion. The Canadian IC is not unique in overlooking the role of intelligence analysis. Johnston (2005) argued that the emphasis in the US intelligence community for a long time had

been on collection and not on analysis; consequently, Bruce and George (2008) commented on the scarcity of literature devoted to issues of analysis. The intelligence capability of Canada's allies has been subjected to scrutiny, drawing attention to the pivotal role of analysis and emphasising the need for significant changes. Unlike its allies, the Canadian IC has not undergone similar review and does not have as strong of an external pressure to change. Efforts towards professionalization of intelligence analysis in the Canadian community have been internally driven. The IACC was stood up in 2006. Its mandate includes performing assessments of the IC and addressing issues that arise, such as training, professional development, and a common human resource strategy. The IALP was established in September 2005 in response to demands raised by analysts for more training. The IALP is acting on behalf of the IACC. Professional training courses have been offered through the IALP for analysts and managers. For example, a ten-day Entry-Level Course for Intelligence Analysts and a three-day Managers of Intelligence Analysts Course have been offered on a regular basis and are open to analysts and managers from various organizations in the community. The IALP also offers a number of specialized courses to members of the Canadian intelligence community. For instance, one of us (David Mandel) taught a one-day seminar, on judgment and decision making under conditions of uncertainty, as part of the IALP's 2008 program offerings. In addition, CAPIA organizes various workshops for analysts to address issues in their profession. Information about course and workshop schedules is disseminated through a monthly Intelligence Analyst Training Newsletter, published by the IALP, which, in addition to training information, also contains articles discussing various issues related to intelligence analysis. The present authors have contributed to this newsletter (Derbentseva and Mandel 2010b, Mandel 2010).

However, different organizations within the Canadian community have their own understanding of the core standards and competencies for intelligence analysts, perhaps derived from their unique functions. Lack of agreement on essential capabilities for analysts significantly hinders the development of a community-wide training program that would address the needs of the community as a whole. Furthermore, some managers expressed concern that it would be difficult to reach consensus on these issues among departments.

Compared to its allies, the Canadian community has a relatively small size, which offers both potential opportunities and drawbacks. For instance, as a smaller community, the Canadian IC has constraints for employing analysts as well as for developing and maintaining support activities required for conducting analysis and professional development programs. Some managers attributed this lack of application of structured analytic techniques to the lack of resources. There are currently no educational programs that prepare professional intelligence analysts, which could be attributed in part to the lack of a steady demand for such professionals in the Canadian IC . Consequently, there are also no standard educational requirements for entering the profession. Analysts receive most of their training on-the-job through mentoring and ad-hoc courses, with the exception of military intelligence analysts who undergo a more structured and systematic training program.

Also, the relatively small size of the Canadian IC may offer certain advantages. For example, it may be easier for analysts to get to know their colleagues from other organizations working on similar issues. For instance, IEGs may provide a venue for collaboration. Notably, the community, with a relatively small resource base, has put significant effort into developing community-wide training for analysts, which has managed to reach far, particularly because of the relatively small community size. Additionally, as some managers pointed out, a smaller

community brings analysts and consumers closer together. Previously, such closeness was seen to introduce bias into assessments and decisions (e.g., Armstrong 1989). However, the current prevailing view in the literature on this issue argues for bridging the gap between policy and intelligence analysis to ensure relevance of intelligence to policy (Hedley 2007, McLaughlin 2008, Steinberg 2008, Treverton 2008). Nevertheless, the problem of obtaining feedback from consumers remains pertinent.

4 Intelligence analysis: directions for future research

One of the main goals of the present study was to identify research areas that could further our understanding of the intelligence analysis process and potentially provide opportunities for augmenting it. The focus of our discussion in this report has been on behavioural aspects (i.e., cognitive, motivational, social, and organizational) of intelligence analysis. Since intelligence analysis is mainly a product of human reasoning and social interactions, behavioural sciences, broadly defined as various scientific disciplines studying human behaviour, can play an important role in advancing our understanding of and supporting analytic activities (Mandel 2009c, National Research Council 2010). The accumulated knowledge and methodological approaches of the behavioural sciences could be leveraged to improve our understanding of various issues in intelligence analysis identified in this report, such as the mechanisms and impact of various cognitive processes involved in information processing, reasoning, and judgment; the role of motivational factors, individual differences, and organizational dynamics in the process and outcomes of intelligence analysis. Through better understanding of various behavioural factors affecting intelligence activity, behavioural sciences could be applied to improving performance on various intelligence-related tasks. In order to achieve this leveraging successfully, the knowledge of both behavioural sciences and intelligence analysis is required. An example of the integration and a daptation of scientific knowledge to developing practical recommendations for the IC is Heuer's ACH tool designed to mitigate the impact of confirmation bias in hypotheses evaluation.

Although the integration of scientific findings can and has been undertaken from within the IC (e.g., Heuer 1999), Mandel (2009c) argued that the IC's reliance on lone "mavericks" like Heuer is not an effective or proactive approach for the community to stay abreast of scientific developments, and that there are a number of reasons for the IC to outreach to a broader scientific community in fulfilling its R&D requirements. Mandel (2009c, National Research Council 2010) proposed that developing a partnership between the IC and the behavioural sciences community can facilitate the IC's timely exploitation of the knowledge accumulated in various pockets of the scientific community without diverting the IC's resources from its primary mandate of producing intelligence. The practical value of the partnership between the intelligence and behavioural sciences communities was also recognized at the 2009 Ottawa roundtable of the Global Futures Forum's (GFF) Community of Interest on the Practice and Organization of Intelligence (COI POI) that brought together intelligence professionals and the scientific community to discuss the potential contribution of behavioural sciences to the area of intelligence (Campbell and Mandel 2010).

The foregoing examination of managers' responses to our interview questions suggests several areas for extending R&D efforts, in which the behavioural sciences could be utilised to improve our understanding of various cognitive and behavioural phenomena pertinent to the intelligence analysis domain. These areas are outlined in *Figure 6* and are discussed briefly in the following Sections. These research areas can be mapped onto the four dimensions of people, processes, technology, and organization of the intelligence analysis capability development. For example, "selection process," "performance evaluation," and "training" research areas from *Figure 6* address the "People" dimension of capability development. Similarly, "process of analysis," "consumer-producer relationship," "performance evaluation," "knowledge management," "training," and "information management" research areas from *Figure 6* target the "Process"

aspect of capability development. Both "information management" and "knowledge management" research areas address the "Technology" aspect of intelligence analysis capability development. Lastly, "consumer-producer relationship" research area pertains to the "Organization" dimension of capability development.

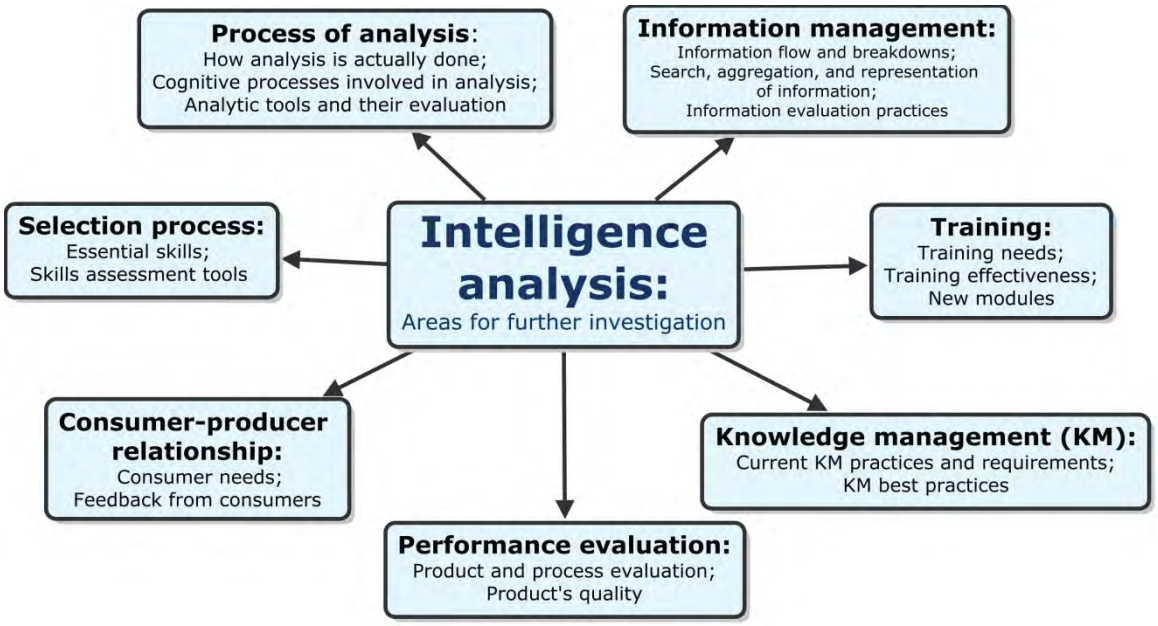

Figure 6: Areas for further investigation

4.1 The process of intelligence analysis

As we commented earlier, until fairly recently, research on analysis had not received a great deal of attention in the international intelligence community. Consequently, the area of intelligence analysis does not have an abundant body of literature, processes or best practices that are as well defined as other disciplines, e.g., medicine or law (Bruce and George 2008, Johnston 2005, Marrin and Clemente 2005). Research on analysis within the Canadian intelligence community is unsurprisingly much scarcer.

We propose that more effort ought to be put into understanding how intelligence analysis is actually done, investigating underlying behavioural, cognitive, and social processes in intelligence analysis, and systematically evaluating tools and techniques that are currently employed by analysts or being considered for adoption. In the sub-sections that follow, we focus on each of these issues in more detail.

4.1.1 Investigation of how analysis is actually done

Most managers commented that currently the "intuitive" approach to analysis is predominant in the community, whereby analysts read a lot, think, and write a report. However, the underlying processes of how analysts search and select what to read; how they evaluate, interpret and use what they read; and what affects and directs their thinking processes and so on are not well described or understood. Understanding the actual process of analysis requires a deeper investigation and better description. More insight into the processes involved in analysis can be achieved through cognitive task analysis, interviews with intelligence analysts, observation of their activities, and socio-technical network analyses of the intelligence analyst role. Application of these methods will reveal cognitive processes and workload, their contingencies, flows of information, and bottlenecks in the analysis process. Obtaining a comprehensive description of the analysis process can help to uncover additional cognitive, motivational, or organizational issues, that will assist in identifying training and tool development needs, and help to further the professionalization of intelligence analysis.

4.1.2 Cognitive processes in analysis

Intelligence analysis is predominantly a cognitive activity that relies heavily on human judgment (e.g., Heuer 1999, Moore 2007). Understanding the analytic process greatly depends on identifying and understanding the underlying cognitive processes involved. Heuer in his seminal work "Psychology of Intelligence Analysis" reinterpreted much of the knowledge accumulated in cognitive sciences into terms that are relevant to intelligence analysis. Although Heuer's book was published in 1999, it represents a collection of articles that he wrote from 1978 – 1986 for internal use within the CIA (author's preface, Heuer 1999). Consequently, most of the research that Heuer reviewed in his book was published in the 1970s and 1980s (Mandel 2009c). Heuer's work remains a valuable sourcebook that integrates psychological issues into the domain of intelligence analysis. However, a decade has passed since the publication of Heuer's book and roughly a quarter century of new behavioural science research has been conducted since Heuer's review. In the intervening period, there has been no systematic effort to incorporate this new body of work (Mandel 2009c). To be accessible and useful to the intelligence community, these findings need to be interpreted in intelligence-relevant terms keeping the community's needs in mind. With support from intelligence experts, the behavioural science community could take the lead in updating "Psychology of Intelligence Analysis" with more recent scientific findings, as well as providing continuous support in maintaining this resource up to date. This effort will ensure that the most recent developments in the behavioural sciences are at the intelligence community's disposal, ready to be exploited.

In addition to utilising findings accumulated by the behavioural sciences, close examination of the analysis process may reveal additional cognitive and behavioural issues, which may be unique to the process of analysis. During our interviews, managers commented on a number of cognitive processes involved in intelligence analysis. Some of these issues require further investigation including the impact of information secrecy on perceptions of information accuracy and value, the impact of information quality on the resulting judgment, analysts' decision avoidance, the relationship between expertise and confirmation bias, and the impact of time pressure on cognitive processes involved in analysis. We discuss these issues in more detail below.

4.1.2.1 Impact of information secrecy

One of the issues mentioned by some managers was the tendency among analysts and intelligence consumers to pay greater attention to classified information as opposed to open source information. Classified information creates an impression of secrecy and importance, and it is believed to have more face validity than information available through open sources (Johnston 2005). McLellan et al. (2008) refer to this purported tendency to overinflate the value of exclusive (i.e., classified) information as the *secrecy bias*. However, the secrecy bias might not be unique to the intelligence profession. Rather, we hypothesize that it reflects a more widespread belief in the plausible supposition that if information is held in secrecy, then it must have the potential to influence, and, thus it must have probable value. Although the presence of this phenomenon has been recognized in both the US and Canadian intelligence communities (Johnston 2005, Lieberthal 2009), more research is needed to better understand its nature and impact.

4.1.2.2 Impact of information quality on judgment

Most of the managers commented that intelligence analysts have to gauge the quality of information they use in their assessments and take the quality of the information into account in their judgments. According to several managers, information deliberately collected (e.g., from HUMINT or other intelligence sources), which may be available to analysts, often comes with an assessment of quality, such as source reliability and information credibility. We have limited understanding of how analysts gauge quality of information and how they incorporate these quality assessments into their judgments. This is a particularly challenging task in situations with multiple pieces of information of varying quality and diagnosticity. A better understanding of how analysts incorporate the quality of information into their judgments is important for developing sound analytic practices. Preliminary studies along this line are currently being conducted at DRDC Toronto (Tombu and Mandel 2010), and more research is needed in this area.

4.1.2.3 Mental representations and estimative judgments

One factor that may affect judgments about a possible future event is one's mental representation of that event. Construal Level Theory (CLT; Trope and Liberman 2003) posits the argument that individuals use low-level construals to represent events that are psychologically near, and use high-level construals to represent events that are psychologically distant. Low-level construals are contextualized representations that include concrete features of the event whereas high-level construals are schematic representations that include abstract features of the event. For example, helping to build a school in Afghanistan can be construed on a low level (e.g., laying bricks and mortar) or on a high level (e.g., providing humanitarian aid). Mandel and McLellan of DRDC Toronto are conducting experimental research based on previous findings (see Wakslak et al. 2006) to test the hypothesis that focusing on another's capability (i.e., a low-level construal) will cause people to make higher probability estimates and shorter time estimates than will focusing on another's motive (i.e., a high-level construal; McLellan et al. 2010a, McLellan and Mandel 2010a). Event construal is manipulated by having participants focus on *how* an event might occur (to induce low-level construal) or *why* an event might occur (to induce high level construal). Questions about an adversary's capabilities and motives are commonly addressed in the intelligence process. For example, an analyst might consider why the adversary would deploy a

dirty bomb (i.e., what are the motives underlying this action?) or how the adversary might do so (i.e., what are the capabilities required to carry out this action?). CLT would predict that focusing on how an event might occur will lead to higher probability estimates than focusing on why that same event might occur. If supported empirically, this effect could have implications for identifying biases in intelligence analysis when making estimative judgments that focus on others' capabilities or motives.

4.1.2.4 Decision avoidance

Given the high degrees of uncertainty associated with intelligence analysis, some managers commented that the difficulty analysts experience with making decisions may become disabling and cause decision avoidance. Analysts may refrain from making judgments in their assessments either by not stating their opinion altogether or stating their opinion in a vague form, allowing for various interpretations. Such assessments may be of little value to intelligence consumers (Steinberg 2008). The two main sources of decision avoidance among intelligence analysts outlined in the literature and mentioned by our interviewees are fear of being wrong (i.e., providing judgments which may later turn out to be mistaken) and pressure to conform to the predominant view among experts on the issue. Both of these causes of decision avoidance most likely have individual/personality and social/situational antecedents. A review of the psychological research conducted on this issue and further investigation of its causes in the intelligence analysis context may be informative to both analysts and managers in understanding the root causes of this phenomenon and finding mitigating factors.

4.1.2.5 Confirmation bias in intelligence analysis

In the intelligence literature, confirmation bias is a frequently cited cognitive propensity that is believed to be particularly damaging to intelligence analysis (e.g., Butterfield 1993, Davis 1992, 2008, Heuer 1999). Some of the most notorious intelligence failures have been attributed to the perils of confirmation bias (e.g., Yom Kippur War, see Davis 2008). The IC (predominantly in the US) has put efforts into combating confirmation bias through the development and implementation of tools such as ACH (Heuer 1999). The IC borrowed the term *confirmation bias* from psychology, and in psychology a number of different phenomena have been studied under the label of confirmation bias since the classic "rule discovery" research (Klayman and Ha 1987, Klayman 1995, McKenzie 2006, Nickerson 1998, Wason 1960). Confirmation bias can refer to the tendency to search for evidence that confirms the currently held hypothesis; the tendency to test instances that are consistent with the currently held hypothesis, but which can produce both confirming and disconfirming evidence; the tendency to give greater weight to the confirming evidence while underweighting disconfirming evidence; and the tendency to interpret ambiguous information as evidence supporting the hypothesis. Different interpretations of confirmation bias represent distinct phenomena, which occur under different sets of circumstances and require different intervention measures. Klayman (1995) differentiated between two general meanings of confirmation bias as: a) "looking for the presence of what you expect, as opposed to looking for what you do not expect," which Klayman and Ha (1987) termed *positive test strategy*; and b) "an inclination to retain, or a disinclination to abandon, a currently favoured hypothesis" (p.386). Klayman and Ha (1987) argued that a positive test strategy, which is often confused with confirmation bias, is an adaptive coping mechanism that can be quite efficient in many hypotheses testing situations (also see Mandel 2010).

Various incidents in intelligence analysis that are labelled as instances of confirmation bias require a closer examination in order to differentiate among distinct cognitive phenomena. In addition, more research is needed to identify the conditions under which different forms of confirmation bias may be a concern in intelligence analysis. For example, McKenzie (2006) demonstrated that confirmation bias occurs only under a very limited set of conditions when people work on familiar tasks. The extent to which confirmation bias and overconfidence, which may be associated with it (McKenzie 2006), is an issue in intelligence analysis is actually unclear. On the one hand, there is a plethora of anecdotal evidence of confirmation bias' negative impact reported in the intelligence literature (e.g., Davis 2008). On the other hand, scientific studies of analytic judgments (although very scarce) suggest otherwise. For example, an analysis of actual intelligence judgments of Canadian analysts provides evidence of underconfidence in judgments, which is associated with the absence of confirmation bias (Mandel 2009b). Similarly, studies with intelligence analysis trainees on unfamiliar tasks (i.e., posterior probability assessments) reported by Mandel (2009a) suggest underconfidence (and hence, the absence of confirmation bias) in analysts' judgements, which is reduced with training. In the absence of confirmation bias, measures that are designed to mitigate it may actually be detrimental, because they may reduce analysts' confidence (i.e., increase their underconfidence) and, thus, decrease analysts' judgment accuracy.

It is also important to investigate the relationship between expertise and susceptibility to confirmation bias. Accounts of the hindering impact of expertise on recognising unusual developments have been reported by our interviewees and in the intelligence literature (Davis 2008). The relationship between expertise and confirmation bias has not received a great deal of attention in the psychological literature. An argument for both mitigating (e.g., see Klayman 1995 for a review) and hindering (e.g., Bilalic et al. 2008) effects of expertise on the performance of different tasks and confirmation bias have been made, and fragmented studies on this topic report contradicting results. The relationship between expertise and confirmation bias is especially pertinent to those intelligence organizations that hone analysts' expertise. Further investigation of this relationship will contribute to a better understanding of intelligence analysis and also will contribute to the general bodies of knowledge on expertise and cognitive psychology.

4.1.2.6 Effect of time pressure on thinking and reasoning

Intelligence assessments are usually time sensitive, and time pressure has been identified as one of the enduring characteristics of intelligence analysis (Johnston 2005, Treverton 2008). As we discussed above (see Sub-section **3.2.2.3**), research in cognitive psychology has shown that time pressure has an impact on cognitive processes, often in a hindering fashion (for a review, see Maule and Edland 1997). However, specific effects of time pressure on intelligence analysis processes and the magnitude of its impact on the quality of analytic assessments may benefit from additional directed attention. Identification and description of the actual intelligence analysis process may be instrumental in designing a research program designed to investigate the specific impact of time pressure on the cognitive processes involved in intelligence analysis as well as potential adaptation mechanisms and mitigating factors.

4.1.3 Methods for representing and organizing information to promote analytic rigour

Identifying appropriate and advantageous ways to represent and organize information for analysts during their thinking process was identified at a recent GFF workshop as an important direction for future behavioural science research in support of intelligence analysis (Campbell and Mandel 2010). Winston (1992) pointed out that "once a problem is described using an appropriate representation, the problem is almost solved." Various tools provide different ways of organizing information. For example, using ACH (Heuer 1999), an analyst constructs a matrix with pieces of evidence listed down the side and alternative hypotheses listed across the top (see *Figure 7*). Such a matrix generates an intersection between each piece of evidence and each of the hypotheses, drawing analysts' attention to the relationship between evidence and hypotheses.

	Hypothesis$_1$	**Hypothesis$_2$**	**Hypothesis$_3$**	**…**	**Hypothesis$_n$**
Evidence$_1$					
Evidence$_2$					
Evidence$_3$					
…					
Evidence$_m$					

Figure 7: ACH matrix

However, evidence as it is presented in ACH forms a list of seemingly independent statements, which may not always be the case, and ACH does not provide the means to account for potential contingencies. Interdependencies and contingencies among variables may be better captured in a graph-like representational form such as Concept Maps (CMaps). CMaps are graphs of interconnected concepts with labelled relationships, which are intended to capture and map the author's conceptual understanding of a topic. CMaps allow for the creation of intricate knowledge models, which facilitate the preservation and sharing of ideas. For example, Derbentseva and Mandel (forthcoming-b) developed a CMap knowledge model of intelligence analysis that was created to capture and represent conceptual interdependencies in various topics pertinent to intelligence analysis. Although CMapping has been adopted by some intelligence organizations in the US (Hoffman 2008), it has remained a relatively unfamiliar tool within the Canadian IC. Derbentseva and Mandel organized a CMapping workshop for Canadian intelligence subject matter experts, in which they introduced their knowledge model of intelligence analysis and solicited feedback on applications of CMapping within the community (Gauthier 2010). The workshop participants identified a number of potential uses for CMapping within the community, such as to structure analysis, communicate among analysts and with consumers, foster collaboration, and expedite the learning of new desk analysts (Derbentseva and Mandel forthcoming-a). Further work on modifying the knowledge model to better suit the community's needs, investigating other applications of the CMapping tool, and supporting the community's CMapping efforts are currently underway at DRDC Toronto. For instance, a short description of

CMapping as a structured analytic technique appeared in the March 2010 issue of the Intelligence Analysis Training Newsletter (Derbentseva and Mandel 2010b), and a CMap representation of analytic rigour and standards is now included in the Aide Memoire on Intelligence Analysis Tradecraft (Thompson 2010). Analysts may benefit from tools that not only allow them to search for information more effectively, but those that also facilitate thinking and discovery. Both CMapping and ACH seem to fit these requirements, however, more research is required to comprehensively evaluate the potential benefits and shortcomings of the various available representation systems.

4.1.4 Analytical tools and techniques

In order to mitigate cognitive difficulties related to information overload and cognitive biases, the intelligence communities of Canada's allies have been designing and developing various tools that may help analysts. As a result, a variety of tools has been developed and applied in intelligence analysis. Some managers that we interviewed pointed out that tools are not used as much in the Canadian community because of the limited resources available for learning and applying them. In addition, some managers commented that there may be a certain degree of resistance to tools among some analysts because "*there is no magic tool that you can use to get the right answer*." Such attitudes may be the result of past experience with tools where they have been found to be inadequate. This attitude may also reflect on the absence of systematic evaluation and the lack of evidence that tool usage "provides better results than unaided expert judgment" (Heuer and Pherson 2010, p.309). Scientific evaluation of tools may shed more light on the applicability, advantages, and limitations of various tools and techniques to support analysis. Although there is value in conducting tool-evaluation studies with naïve subjects (i.e., non-analysts) and generic situations in order to establish "proof of concept," Heuer and Pherson (2010) stressed the importance of ecological validity of situations and tasks used in the evaluation of structured analytic techniques for intelligence analysis. Thus, studies that intend to shed light on the applicability and utility of analytic tools for intelligence analysis need to be conducted with intelligence analysts and under test conditions that are as similar as possible to the analysts' actual working conditions.

4.1.4.1 Identifying the most prevalent tools used in the Canadian community

Some of the managers commented that analysts are aware of a variety of analytic tools; however, the tools are not used extensively in the Canadian community. Given the abundance of existing analytic tools and their infrequent application, it will be beneficial to identify which tools are available to Canadian analysts, which tools analysts actually apply, and which ones do they find useful in their work. Conducting such a survey will be instrumental in directing the development of a tool evaluation program.

4.1.4.2 Evaluating analytic tools

Analytic tools are developed to make the task of intelligence analysis easier and to reduce the effect of cognitive biases inherent in human reasoning. A considerable number of analytic techniques have been developed and introduced into the intelligence community (CIA 2005, 2009, Davis 1992, DIA 2008, Heuer 1999, Jones 1998). Many of the techniques, however, have not been systematically evaluated, and the literature on analytic technique evaluation is relatively

sparse and fragmented (Heuer and Pherson 2010, Johnston 2005). Examples of a small number of quantitative studies aimed at investigating the effect of analytic techniques include work by Folker (2000), Cheikes et al. (2004) and Pirolli (2006) that evaluated ACH. Folker (2000) tested the effectiveness of ACH compared to an intuitive approach and found that it facilitated arriving at the correct solution in only one of two scenarios tested. Cheikes et al. (2004) investigated the effectiveness of ACH in mitigating confirmation bias and also found mixed results. ACH mitigated confirmation bias only in participants with no prior analysis experience. Pirolli (2006) evaluated the application of ACH under different conditions but did not include a control group that did not use ACH. In the first study, Pirolli compared a paper ACH method with a computerised ACH tool and did not find significant differences in how participants structured the problem or on performance. In the second study, Pirolli examined the utility of ACH in mitigating confirmation bias in groups and found mixed results. The initial bias decreased in individuals working alone and in heterogeneous groups, but the initial bias increased in homogeneous groups. Moreover, the observed results cannot be conclusively attributed to the application of ACH as the study did not include a control group that did not use the tool. Consequently, the results of various studies evaluating ACH while somewhat promising, are inconclusive and call for further investigation. Moreover, Heuer and Pherson (2010) questioned the external and construct validity of some of the empirical tests of ACH.

As we argued above, there is a need for a systematic evaluation of the tools and techniques used in the intelligence domain. Developing a research program that will rigorously evaluate analytic techniques might be of value to the intelligence community as it will allow for more educated choices about which tools to employ. A systematic research program will not only investigate whether or not a given technique does indeed reduce a certain bias, but it will also examine what aspects of the technique make it effective. It will examine the application of techniques under different conditions and varying task structures, and will provide an overall better understanding of the tool. For example, ACH (Heuer 1999) combines several analytic sub-methods, such as:

- externalising evidence, hypotheses, and assumptions;
- generating an (exhaustive) set of hypotheses before evaluating them against the evidence; and
- creating lists of evidence and hypotheses;
- systematically evaluating each piece of evidence with respect to each hypothesis;
- paying attention to disconfirming (rather than confirming) evidence.

One possible direction for future research would be to examine the relative contribution of the methods employed in ACH under different conditions. Another research direction could challenge the underlying assumptions of ACH and examine the method's robustness. Other tools may be evaluated following this approach. As Heuer and Pherson (2010) suggested, evaluation of tools should employ a variety of methods such as surveys of analysts who use the tools, observations of analysts at work, and structured interviews with analysts, managers, and consumers. In addition, tool evaluation ought to rely on a variety of dependent measures (i.e., measures of quality) such as accuracy, clarity of presentation, transparency of the analytic process and conclusions, and construction of a record of the analytic process.

4.2 Information management

Intelligence analysis is a highly information-dependent activity. Both psychological issues related to information processing and systemic issues related to information flows within and between organizations have a significant impact on intelligence production.

4.2.1 Study of systemic issues: Identifying breakdowns between information requirements and existing flows

The quality of analysis depends on the availability of relevant information, and the quality of the information on which analysts rely in making their assessments. The ability to find relevant information and reliably evaluate it is determined to a great extent by the established information flows within an organization and among related organizations. Information flows are concerned with the storage, access, and transmission of information. This may include a variety of information systems to which analysts have access, such as networks and databases, chains of communication and available communication means, and may include formally established systems, flows, and reporting chains as well as informal networks. Intelligence assessments are often time-sensitive, and therefore it is important for analysts to have access to relevant information in a timely manner. Analyzing information requirements and current flows within an intelligence unit will help to identify any existing discrepancies between the requirements and capabilities, which may positively impact a unit's functioning if resolved.

4.2.2 Calibration study of source reliability and information credibility assessments by information collectors

In addition to gaining timely access to relevant information, analysts need to have reliable means to evaluate the quality of the available information. As we discussed above, intelligence analysts do not collect "raw" information first-hand and have to rely on information collected and processed by others (Pritchard and Goodman 2009). Therefore, analysts may need to rely on other people's assessments of information reliability and accuracy. Each piece of information collected through specialized intelligence means is rated on two dimensions: reliability of the source and credibility of information. Some managers commented that these evaluations are not always done in a timely manner or updated when changes are required, especially for HUMINT sources.

In order to gauge the accuracy of the assessments for source reliability and information credibility a calibration study of these assessments may be undertaken. Research conducted by Mandel (2009b) on calibration of the accuracy of analysts' judgments as discussed in Sub-section **3.1.9** could be extended to gauge the calibration of information collectors and handlers of HUMINT sources in assessing accuracy of source reliability and information credibility. Similar to determining the accuracy of analytic judgments, the accuracy of certain pieces of information provided by HUMINT sources may be evaluated at a later point in time. A dataset can be designed that consists of a number of pieces of information gathered by a source handler, reliability and credibility evaluations for each piece of information assigned by the source handler, and a rating of whether each piece of information was accurate or not. Similar to a calibration analysis of analysts' judgment conducted by Mandel (2009b), a calibration analysis of source handlers' assessments of sources and information could be performed. Such a calibration

study would provide feedback to information collectors on their overall accuracy, and would provide more information and justification to analysts who rely on these assessments.

4.2.3 Information management: Search, aggregation, and collation of information

Technological progress has significantly affected the information world around us. The amount of available information has grown; the variety of sources from which information could be obtained has increased, and the speed with which information can be transmitted has also increased drastically. More and more information is available to analysts from various open sources in addition to information specifically collected through various intelligence means.

Intelligence analysts are faced with a constantly increasing amount of information, but the quantity of available information does not translate necessarily into quality and reliability. It is virtually impossible for analysts to undertake exhaustive searches for information on an issue as there are usually time constraints to which they need to be mindful. Without conducting an exhaustive search, analysts cannot know what other information may be available; in other words, they have no means of determining whether or not they have overlooked an important piece of information in their search. The effectiveness of analysts' searches depends to a great extent on the design and management of various information systems that analysts use. The effectiveness of information management systems in turn, requires a timely and thorough collation of new information and the development of a comprehensive ontology to allow expedited searches of relevant information.

In addition to the examination and potential improvement of existing information systems and collation practices, it may be beneficial to develop training programs for analysts on effective information search strategies and query formulation as Patterson et al. (2001) suggested.

4.3 Study of consumer-producer relationships

Intelligence consumers have an important role to play in the process of intelligence production. Intelligence producers depend on their consumers, to some extent, for direction, requirements, and feedback on the impact of their intelligence products. In order to be relevant, intelligence producers – analysts and their managers – need to be able to accurately gauge consumers' current requirements and anticipate their potential future requirements. Feedback from consumers is essential for intelligence organizations in directing their efforts and making their products relevant and usable. The two groups operate in different organizational environments and are subjected to different pressures and constraints; and although there is a great deal of dependency of producers on consumers, there do not seem to be many opportunities for interaction. The two groups may differ in:

- their perceptions of the role that intelligence products ought to play in consumers' decision making,
- their perceptions of the characteristics and properties of a good intelligence product,
- the constraints they must face, and
- the requirements of their environments.

A closer examination of the current dynamics of consumer-producer relationships in the Canadian context may be instrumental in improving the understanding of the existing issues, their causes, and potential ways to bridge gaps. However, the success of such an investigation would greatly depend on the interest and input from the intelligence community and their consumers.

4.4 Knowledge preservation and transfer practices

Under conditions of high personnel turnover, analysts frequently leave the organization taking with them valuable knowledge and experience. Training new analysts is costly and time consuming as there seems to be no established means to transfer knowledge accumulated by departing analysts to the new arrivals. This issue is not unique to the Canadian intelligence community as Treverton and Gabbard (2008) observed similar issues in the US community. Furthermore, it is not unique to the domain of intelligence analysis as many companies in industry, in addition to the usual turnover rate, have to deal with an aging workforce and the retirement of a substantial proportion of their experts. Implementing effective knowledge preservation and transfer practices has the potential to reduce disruptions caused by the constant turnover of military personnel, reduce the learning curve for new analysts, and ensure continuity. A review of the existing best practices in knowledge preservation and transfer in industry, along with ways and means to implement them, may be valuable to the intelligence community.

4.5 Selection and assessment criteria

Research from the social sciences could be utilized to inform selection processes for intelligence analysts. Research in this domain could take two directions: identifying stable individual difference characteristics that predict performance, and developing tools to assess them. Naturally, research in this area will be closely related to the development of valid measures of analysts' performance, which we discuss in Section **4.7** below.

As some managers pointed out, in addition to certain skills that may be acquired through training and experience, successful intelligence analysts possess a certain set of inherent characteristics. It would be instrumental to the optimal selection of intelligence analysts to be able to identify these inherent traits. One way to do so would be to assess stable individual differences (e.g., the Five Factor Model, and the NFC and the NFCC scales) among analysts, and then compare them to both subjective performance evaluations and objective judgment accuracy measures, as described in Mandel (2009b). Identifying traits that reliably predict sound analysis would benefit selection procedures for analysts.

In addition to identifying and assessing stable traits on which to select analysts, it would be useful to examine skill sets that predict performance. New assessment measures that are uniquely tailored to the analyst profession could be developed in close collaboration with intelligence managers. In developing these measures, the set of essential skills and capabilities that managers identified could be taken as a starting point, which could then be refined upon further discussion with intelligence professionals. As part of the selection process, candidate intelligence analysts could be assessed on the identified dimensions. There have been some efforts in the intelligence community devoted to identifying intelligence analysts' skill sets (e.g., Johnston 2005, Moore and Krizan 2003, Moore 2005, Moore et al. 2005, Moore 2007); however, these have not been correlated with analysts' performance.

4.6 Training

As we noted above, one of the challenges in intelligence analysis training is evaluating its effectiveness. An organization such as DRDC could provide support to the intelligence community in designing and administering comprehensive and objective evaluations of current training programs. To do so, DRDC could consult with course instructors to identify training objectives, and to develop tools to assess the degree to which these objectives are being met. Initial efforts in this direction are currently being undertaken by members of TRIG in collaboration with the Canadian Forces School for Military Intelligence (CFSMI). One aspect of the research program evaluates the effectiveness of cultural sensitivity training developed by CFSMI instructors for reducing bias in attitudes toward an out-group (e.g., Arab-Muslims). Explicit (i.e., self-report) and implicit (i.e., sub-conscious reaction-timed) measures of attitudes are administered before and after training to empirically assess the impact of the training attitudes toward the out-group (McLellan et al. 2010b). Showing a preference for one group over another has implications when making judgments and decisions that involve members of these groups.

As previously mentioned, intelligence analysis is predominantly a cognitive activity, and incorporating the most recent findings in cognitive and behavioural sciences into training will provide analysts an opportunity to utilise this knowledge in practice. Keeping intelligence training up to date with recent developments in behavioural sciences may be taxing on intelligence organizations' resources, and collaboration with the scientific community can be advantageous (Mandel 2009c). Drawing on expertise in the social sciences, DRDC may be instrumental in identifying needs and developing new training modules for intelligence professionals. For example, one of the authors (Mandel) utilised his expertise in behavioural decision research to design and teach a one-day course on judgment and decision making under uncertainty offered to intelligence analysts in the context of IALP training program. In addition, Mandel developed a training module to improve Bayesian reasoning with visual representations of probabilistic information (Mandel 2009a). The training has been extended to include several representation methods, which have been tested on the general population with positive results (Derbentseva and Mandel 2010a). In addition, the training has been shown to improve the posterior probability judgment accuracy of intelligence analyst trainees at CFSMI (Mandel 2009a). More generally, the behavioural science community can provide valuable support to the IC in developing and evaluating intelligence analysis training.

4.7 Performance evaluation

Performance of intelligence analysts is greatly contingent on the quality of their intelligence assessments. As we discussed in Sub-section **3.1.9**, the quality of intelligence assessments may be evaluated by examining two main criteria: the intelligence process and the intelligence product (Moore and Krizan 2003). Currently, performance on both criteria is evaluated mostly according to managers' subjective judgment.

4.7.1 Evaluating intelligence products

Although a set of criteria as outlined by Brei (2005) and Moore and Krizan (2003) – usability, relevance, and timeliness – may be used in assessing intelligence products, these criteria may not fully capture the value added by an intelligence product. A product's quality needs to be assessed, but "quality" is a complex and multi-faceted term.

Investigating the meaning of the "quality" of a report to different stakeholders (i.e., consumers, managers, and analysts) may be informative in revealing differences in the perceived value of intelligence assessments. Such an exercise could also facilitate the articulation of other criteria for assessing the quality of intelligence products, in addition to those identified by Brei (2005).

Calibration of analysts' judgments accuracy may be another criterion for evaluating intelligence reports. Working in an environment characterized by uncertainty, analysts are bound to make incorrect judgments at least some of the time. For this reason, the ability of analysts to accurately estimate confidence in their judgments (i.e., to be well calibrated) is paramount. To be well calibrated is to have insight into one's own thought processes and to be well-attuned to factors (both internal and external) that affect the likelihood that one's predicted estimate will occur. When analysts can accurately communicate confidence in their judgments, stakeholders can use this information when making decisions, especially those that are contingent on the predicted outcome.

4.7.2 The intelligence process: Investigating the feasibility of developing a standard "Challenging mechanism"

Some managers commented that they find it difficult to challenge the thinking process and the quality of analysis of their analysts without having sufficient background on the issue being analysed. In order to ease this process, some managers suggested that it may be possible to develop a standard challenging mechanism that could be applied to evaluate the soundness of analysis regardless of the evaluator's background knowledge on the issue. Such a mechanism, would address information selection and interpretation, assess logic and thinking, examine the validity of underlying assumptions, and probe for potential distortions due to biases. It is worthwhile to investigate the possibility of developing such a generic evaluation mechanism. A deep understanding of the intelligence analysis process and potential issues will be essential in this effort. However, if the effort is successful, the resulting mechanism may be used by both managers and analysts themselves to improve the soundness of their analyses.

5 Concluding remarks

In the context of the year for scoping the "Understanding and Augmenting Human Capabilities in Intelligence Production" ARP, we conducted interviews with intelligence managers from two Canadian intelligence organizations: CDI and IAS. The aim of the interviews was to identify the existing issues and areas for further R&D in the social and cognitive science domains that may be beneficial to the intelligence community. In this report, we summarized and discussed the issues raised by the managers during the interviews and offered potential areas of further research.

We have identified a number of areas where further scientific research may be of value to the Canadian intelligence community. These include: current analytic methods employed in the community and evaluation of their effectiveness; cognitive processes involved in intelligence analysis; validation of various analytic tools; investigation of information dependencies, flows and breakdowns; development and evaluation of training; investigation of stable individual differences and capabilities that are essential for intelligence analysis; knowledge preservation, management, and transfer; issues, perceptions, and dynamics in consumer-producer relationships; and issues in performance and intelligence product evaluation.

Bruce and George (2008) argued that, although thousands of professionals practice the "craft" of intelligence analysis daily, the professional discipline of intelligence analysis and what constitutes good analytic principles and practices remains largely undefined. Intelligence analysis has only recently come into the centre of attention and (unclassified) scientific research literature devoted to it is still rather scarce. With a gradually growing body of dedicated literature, intelligence analysis is only beginning to undergo its professional formation (Bruce and George 2008, Fisher and Johnston 2008). There are important opportunities for the social and cognitive sciences to make contributions to this field and its development. The identified areas for R&D encompass many issues and span over several disciplines. Clearly, it would be impossible to address all of the identified questions within the scope of a single project. The priorities for future work need to be identified through continuous and close interaction with members of the Canadian IC.

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Annex A Initial List of Interview Questions

A.1 Primary list of questions

A.1.1 Managers' Background

- Could you tell us about your educational and career background?
- How long have you worked at IAS (CDI)?
- How long have you been in the manager role at IAS (CDI)?
- How many analysts currently report to you?
- All together, how many have you managed in the past?
- Were you an intelligence analyst at some point in your career? If yes, for how long?

A.1.2 Analyst Tasks

- Could you tell us about the range of tasks that analysts reporting to you typically have to perform?
- Could you describe the steps, cycles, or processes that are involved in completing these tasks?
- What are the major difficulties, if any, associated with each task?
- What are the forms that analysts' products tend to take?

  a. For reports: are these: mostly qualitative; mostly quantitative; or roughly an even balance of the two?

  b. Are they mostly descriptive / explanatory / predictive?

- What are the types of queries posed to analysts?
- What are the typical timelines for assessment completion?
- Do analysts work on a single report at a time or do they work on multiple reports simultaneously?
- How do analysts deal with issues regarding the communication of uncertainty of events in their reports?

  a. Are there standard procedures in place for assessing and communicating uncertainty? If not, do you think this an issue that needs more attention?

A.1.3 Analyst Capability

- What is the selection procedure for analysts? Are there cognitive skills or trait qualities that are tested?
- What level of formal education and career backgrounds do analysts typically have? What are the predominant disciplines from which they are recruited?
- What intelligence analysis training have the analysts reporting to you received?
- Do analysts learn about issues such as cognitive biases and mindsets that can impair their judgment?

  a. If so, about which biases and mindsets do they learn?

  b. Do they learn about ways of mitigating the impact of mindsets and biases?

  c. Are there tools or procedures in place that are specifically designed to correct for these biases?

- Is the effectiveness of training evaluated?

  a. If so, how regularly?

  b. In what manner?

  c. What have such evaluations revealed about the adequacy of training?

  d. How do you think training might be feasibly improved?

- How is analyst performance evaluated? (i.e., what are the criteria?)

  a. Do analysts receive feedback and training support based on those evaluations?

- In your view, what are the skills and capabilities that analysts bring to the job that are most important in being effective as an analyst?
- In your view, what are the greatest challenges to human capability development for intelligence analysts?
- Are there specific tools that analysts use?

  a. If so, which ones?

  b. What are their advantages and disadvantages?

  c. Are analysts required to use them?

- A number of issues have been raised regarding the ability of analysts to produce good intelligence; of these, which would you identify as the top 3 concerns that ought to be addressed?

A.1.4 Management Tasks

- Could you describe the main functions and tasks that you perform as a manager?
- Could you describe the steps, cycles, or processes that are involved in completing these tasks? Given that these may differ for the different major tasks you perform, please feel free to expand on each task separately.
- What are the major difficulties, if any, associated with each task?
- Are some tasks more challenging than others? If so, what makes them more challenging?

A.1.5 Management Capability

- In your view, what are the skills and capabilities that you bring to the job that you believe are most important in being effective as a manager? Given that these may differ for the different major tasks you perform, please feel free to expand on each task separately.
- Are there other skills and capabilities that you think are particularly important for managers of intelligence organizations to have?
- In your view, what are the greatest challenges to human capability development for managers of intelligence organizations?
- What do you think might be done to meet these challenges–that is, to improve upon human capabilities for the management of intelligence analysis?
- Can you think of any other information that we haven't covered today that you think would be useful to our research? (e.g., intelligence issues, resources, points of contact)

A.2 Additional (secondary) questions

A.2.1 Manager's Background

- Could you tell us about the types of management training you may have received?
- What training did you receive as an analyst?

A.2.2 Analyst Task

- Are the analysts' products mostly of tactical / operational / strategic importance?
- Are analysts usually specialists (e.g., in SIGINT) or generalists?
- To what extent do analysts draw from a variety of different sources of information (e.g. HUMINT, SIGINT, IMINT, COMINT, OSINT etc.)? Which sources tend to be most important or most often used for the types of intelligence assessments made in your organization?

A.2.3 Analyst Capability

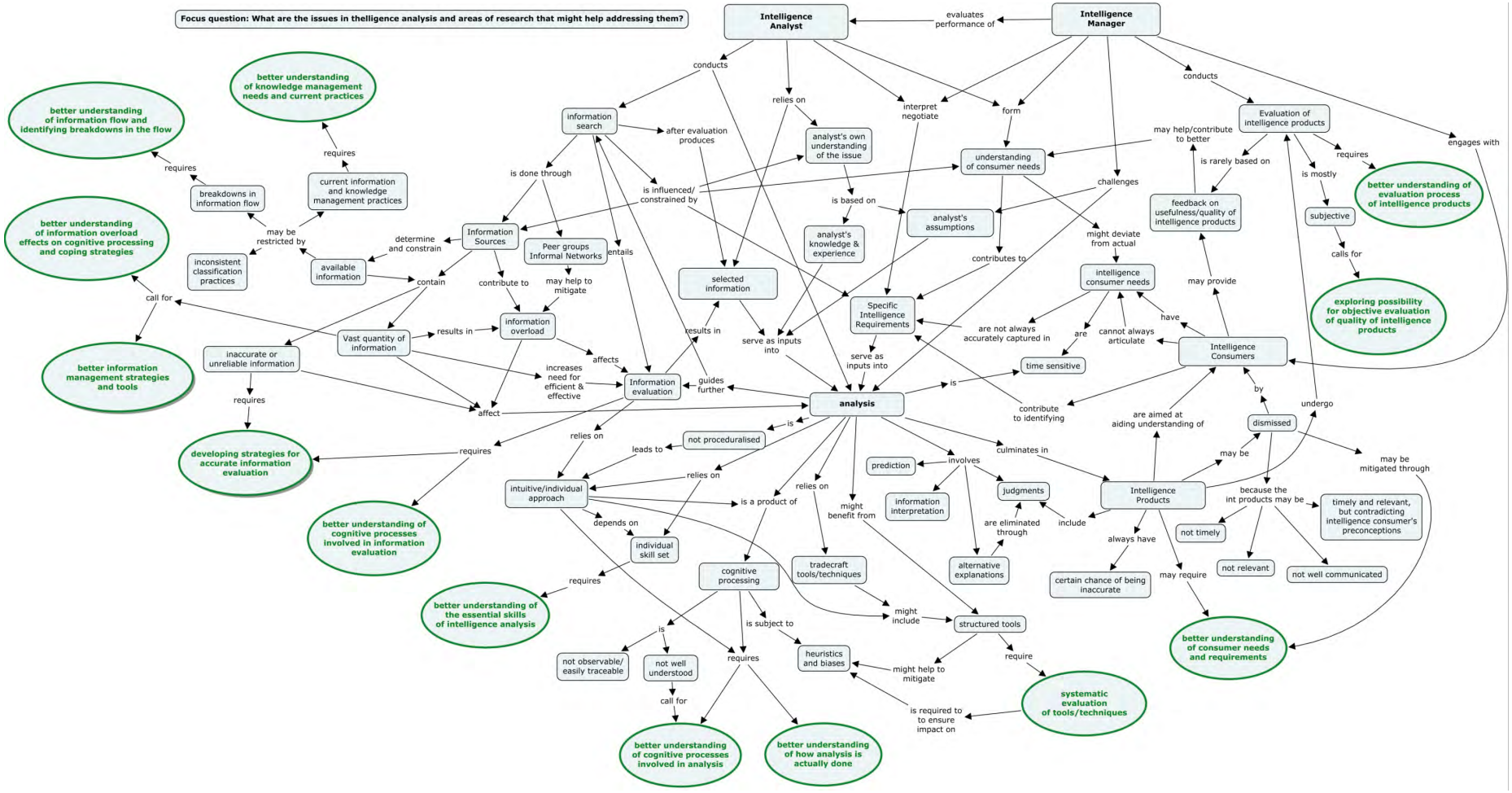
- What is your view on professionalization of the intelligence community?

Annex B Taxonomy of Problem Types[7]

Characteristics	Problem Types				
	Simplistic	**Deterministic**	**Moderately Random**	**Severely Random**	**Indeterminate**
What is the question	Obtain information	How much? How many?	Identify and rank all outcomes	Identify outcomes in unbounded situation	Predict future events/situations
Role of facts	Highest	High	Moderate	Low	Lowest
Role of judgment	Lowest	Low	Moderate	High	Highest
Analytical tasks	Find information	Find/create formula	Generate all outcomes	Define potential outcomes	Define future factors
Analytical method	Search sources	Match data to formula	Decision theory; utility analysis	Role playing and gaming	Analyse models and scenarios
Analytical instrument	Matching	Mathematical formula	Influence diagram, utility, probability	Subjective evaluation of outcomes	Use of experts
Analytical output	Fact	Specific value or number	Weighted alternative outcomes	Plausible outcomes	Elaboration on expected future
Probability of error	Lowest	Very low	Dependent on data quality	High to very high	Highest
Follow up task	None	None	Monitor for change	Repeated testing to determine true state	Exhaustive learning

[7] From Krizan, L. (1999). Intelligence Essentials for Everyone. Joint Military Intelligence College.

Annex C Concept Map outlining issues in intelligence analysis



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List of symbols/abbreviations/acronyms/initialisms

ACH	Analysis of Competing Hypotheses
AIS	Adversarial Intent Section
ARP	Applied Research Program
CAPIA	Canadian Association of Professional Intelligence Analysts
CDI	Chief of Defence Intelligence
CFSMI	Canadian Forces School of Military Intelligence
CIA	Central Intelligence Agency
CLT	Construal Level Theory
CMap	Concept Map
COI POI	Community of Interest on the Practice and Organization of Intelligence
COMINT	Communications Intelligence
DIA	Defence Intelligence Agency
DGMPRA	Director General Military Personnel Research & Analysis
DRDC	Defence Research & Development Canada
GFF	Global Futures Forum
HREC	Human Research Ethics Committee
HUMINT	Human Intelligence
IACC	Intelligence Assessment Coordination Committee
IALP	Intelligence Assessment Learning Program
IAS	International Assessment Staff
IC	Intelligence Community
IEG	Interdepartmental Expert Group
IMINT	Image Intelligence
ITAC	Integrated Threat Assessment Centre
MACE	Method for Assessing the Credibility of Evidence
NFC	Need for Cognition
NFCC	Need for Cognitive Closure
NSA	National Security Agency

ODNI	The Office of the Director of National Intelligence
OSINT	Open Source Intelligence
PCO	Privy Council Office
R&D	Research & Development
ROI	Return On Investment
SIGINT	Signals Intelligence
TRIG	Thinking, Risk, and Intelligence Group
TSD-PI	Trait Self-Descriptive Personality Inventory Revisited measure
UK	United Kingdom
US	United States
WMD	Weapons of Mass Destruction

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(U) Intelligence analysis provides important informational support to civilian and military decision makers. Recent intelligence failures of Canada's allies have been attributed mostly to cognitive, social, and organizational deficits and biases of individual analysts and intelligence agencies. Such attributions call for a comprehensive examination of the intelligence production from the socio−psychological perspective. The present report discusses findings from the interviews conducted with Canadian managers of intelligence analysts. The interviewed managers identified a number of pertinent issues in the intelligence production process that may be explicated through the application of the behavioural sciences' accumulated knowledge and methodology. The identified issues are discussed in light of the intelligence studies and behavioural sciences literature, and a roadmap for the behavioural sciences research program in support of the intelligence function is outlined.

(U) L'analyse du renseignement offre un important soutien informationnel aux décideurs civils et militaires. Les récents échecs d'alliés du Canada dans le domaine du renseignement ont été principalement attribués à des lacunes cognitives, sociales et organisationnelles, ainsi qu'aux préjugés des analystes et des organismes du renseignement. Un tel constat exige la tenue d'un examen en profondeur de la production du renseignement d'un point de vue socio−psychologique. Le présent rapport porte sur les conclusions tirées des entrevues menées auprès de gestionnaires canadiens d'analystes du renseignement. Les gestionnaires interviewés ont dégagé un certain nombre de problèmes pertinents dans le processus de production du renseignement que l'on pourrait expliquer par la mise en application des connaissances et des méthodes acquises dans le domaine des sciences du comportement. Les problèmes relevés sont abordés sur la base d'études sur le renseignement et de publications sur les sciences du comportement. Le rapport contient également l'aperçu de la feuille de route d'un programme de recherche en sciences du comportement qui appuierait la fonction du renseignement.

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(U) Intelligence analysis; Canadian intelligence community; issues in intelligence analysis; behavioural sciences

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